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AUDIO VISUAL

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JOHN E. COULSON AND HARRY F. SILBERMAN

Tempt Me Not With Your Gold, Fine Sir
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Recognition Learning under Multiple Channel Presentation
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Television in Army Training: Color vs Black and White (Part II)
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ANNOUNCEMENT

The editors wish to announce these appointments to the AVCR *editorial staff: Loran C. Twyford, Jr., editor for Research Abstracts; Robert W. Wagner, Media editor; David E. Strom, editor, World Communications; and A. A. Lumsdaine, who will edit a department (not yet named) on teaching machines, self-tutoring materials, and programmed learning sequences.*

Dr. Twyford is consultant on educational communications for the New York State Education Department; Dr. Wagner, professor, and director of the Motion Picture Division, Department of Photography, The Ohio State University. Mr. Strom is manager of the Film Distribution Section, Colonial Williamsburg; and Dr. Lumsdaine, professor of education, University of California at Los Angeles. The appointment of George Gerbner as book review editor was announced in the previous issue.

—KENNETH NORBERG, DEPARTMENTAL EDITOR

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Automated Teaching and Individual Differences

JOHN E. COULSON AND
HARRY F. SILBERMAN

John E. Coulson and Harry F. Silberman are members of a research project on automated teaching in the Research Directorate of the System Development Corporation, Santa Monica, California.

IN 1958 an automated teaching project was formed by members of the Research Directorate at the System Development Corporation. The functions of this project were to investigate the current status of automated teaching, to conduct research on variables of automated instruction, and to determine what contribution SDC, as a non-profit corporation, might make in the developmental and applied aspects of this field.

Project members began with a review of the "state of the art" as it then existed. This review indicated that, despite an apparent diversity in design, most teaching machines had one characteristic in common: a relative inflexibility of operation. With a given set of instructional materials ("items") in the machine, each student working with the machine would receive the same sequence of items, regardless of his individual capabilities or limitations.

The basic assumption underlying the design of a fixed-sequence teaching machine is that a single sequence of items can be optimally effective for a number of students. This assumption seemed highly doubtful when viewed in the context of the typical classroom, with 20 or more students differing not only in training experience but in inherent ability as well. It appeared that an ideal sequence of items for one student would be less than maximally effective for some other student.

Using certain behavior characteristics of the human tutor as an initial guide, project members considered possible teaching-machine designs which might use different instructional procedures for different students, depending on the students' performance during training. This adaptable feature was termed "machine responsiveness." It was clearly recognized that well-written, well-tested instructional items were essential for any successful automated instruction. Without such materials any teaching machine would be completely useless. Given a good set of items, however, it was believed that the interaction between student response-behavior and machine selection of materials might be an important factor in the effectiveness of automated instruction.

In April 1959, the Automated Teaching Project conducted an experiment with manually operated teaching machines to explore the effectiveness of machine responsiveness, as compared with a fixed sequence mode (1). Responsiveness was introduced by a simplified form of "branching" in which a student who correctly answered an item on a given topic was not shown other items on the same topic.* In this way each member of the "branching" group received a (different) subset of the items seen by the fixed sequence group. Other variables investigated in the same experiment were student response-mode (multiple-choice versus constructed-response) and item step-size (many small steps versus fewer large steps). Materials in elementary psychology were presented to 80 junior-college students. Results of the study were as follows:

1. Training with the manually controlled machines yielded significant student learning in each of the experimental groups.

2. "Branching" students required significantly less training time than "fixed sequence" students, and did not differ on a post-training criterion test.

3. Students receiving many items with small steps learned more than students with fewer large-step items, but also required significantly greater training time.

4. "Multiple-choice" students required less training time than "constructed response" students; the two groups did not differ on criterion performance.

The results of the initial experiment, while not definitive, pointed

*This particular method of branching was unquestionably crude, and the criterion for branching somewhat unrealistic. It was found, however, that more complex forms of branching were not feasible with the manually operated machines.

toward an advantage in favor of machine responsiveness over the fixed sequence mode of instruction when training time was taken into consideration. At the same time, experience with the manual devices clearly indicated the desirability of more automatic equipment capable of controlling complex patterns of instructional variables. Project members believed that a computer-based teaching machine would offer maximal responsiveness to individual differences, as well as a high degree of flexibility as an experimental tool.

Before designing a teaching machine with responsiveness to individual differences, however, it was necessary to explore the effects of negative reinforcement in automated teaching.

Since a "responsive" teaching machine uses student errors to determine the sequence of items, it follows that most students will make at least a few errors during each training session. If this were not true, all students would receive the identical sequence. Consequently, an experiment was performed to determine the effects on learning of student errors and resulting negative reinforcement (2). Again manual equipment was used, this time to present instructional items in logic to 28 junior-college students. Results indicated that a relatively small number of errors (negative reinforcements) dispersed among correct responses did not affect student learning adversely, but that massed negative reinforcements did hinder learning. The conclusion drawn was that student errors could be used for sequence control in a responsive teaching machine, but that items should be so written that the student would not miss many items in a row.

Computer-Based Teaching Machine

In early 1960, SDC completed work on an experimental teaching machine consisting of three major units: (1) a Bendix G-15 computer; (2) a random access slide projector; and (3) an electric typewriter (Fig. 1).

1. *Bendix G-15 Computer.* This serves as the central control unit for the teaching machine. It contains the master control program which governs the operation of the entire machine. The computer determines, at all times during a training session, what materials are to be presented to the student. It analyzes student responses to the instructional material and compares these responses with stored data.

Rolls of paper tape, each of which can hold the necessary information for a different instructional lesson, are contained in easily interchange-

FIGURE 1. *Components of experimental teaching machine. A digital computer (1) controls the operation of the random access slide projector (2) which displays instructional items. The student answers questions and receives knowledge of results through an electric typewriter (3).*

able magazines. A bell mounted in the computer frame can be rung under computer control, thus permitting programmed auditory signals.

2. *Random Access Slide Projector.* Developed by the engineering staff at SDC, this projector holds up to six hundred 35mm slides in 15 magazines of 40 slides each. It receives instructions from the G-15, selecting and projecting instructional slides in the sequence indicated by the computer.

3. *Electric Typewriter.* Two primary functions are served by the typewriter, which is linked to the Bendix computer. First, the student uses the keyboard to insert his answers to the instructional materials, normally in multiple-choice form. Second, the computer program takes control of the typewriter to print messages telling the student how successful he has been in answering the questions.

Functional Characteristics of Experimental Machine

The student begins with a "basic series" of items, each of which he attempts to answer in multiple-choice fashion by pressing a key on the typewriter keyboard. He receives appropriate knowledge of results after each attempt. Every item presented to him is registered within the computer control unit as having relevance to one or more specific topics to be taught. The computer keeps a record of the student's performance on each item and a cumulative record of his performance on each of the topics covered by the items. These performance measures may include the student's response times as well as his error count. If student performance falls below a certain level for a particular topic, the student is branched to a special set of items which provide remedial work on that topic. He may be taken through the entire remedial routine, or may be brought more quickly back to the basic series if he performs well on the remedial items.

On returning from the remedial routine the student again receives items from the basic series, continuing until he has finished this series or until his performance once more falls outside certain programmed limits. In the latter case, he is again branched temporarily from the basic series.

In certain cases, a single missed item on a particular topic may be sufficient to take the student to a remedial routine. The teaching machine not only recognizes that an item has been answered incorrectly, but also considers the specific incorrect alternative chosen. Certain answers may be indicative of a serious misunderstanding by the stu-

dent and may cause the machine to branch immediately to a remedial sequence.

If a student does very poorly in his training and requires excessive remedial work (according to programmed criteria), the machine may take him completely out of the original series, branching him into an alternative basic series. This alternative series represents not simply a remedial routine, but a major change in the training approach. The original series might, for instance, use the procedure of first giving general rules, and then presenting examples to illustrate the rules; the alternative series might reverse the order, gradually building up to a general rule by a progression of illustrative examples.

In the event that a student's performance on some topics of a basic series is sufficiently high, the teaching machine skips certain items for these topics, thereby allowing the brighter student to progress rapidly to more advanced topics.

At various points during the training session the student may be required by the machine to indicate his degree of confidence concerning his own learning progress. If he expresses a feeling of confusion or lack of understanding, he may be taken to a remedial branch even though his actual performance is above the normal criterion level for such a branch. An expression of great self-confidence, on the other hand, may cause the student to be returned more rapidly from a remedial routine to the main sequence.

The operation of the experimental teaching machine may be illustrated by means of the flow chart opposite (Fig. II). This chart does not represent an actual instructional sequence, but is merely used to demonstrate some of the types of decisions that can be made by a computer-based teaching machine. Each of the numbered squares symbolizes an instructional item. After the student has answered questions in items 1 and 2, the computer determines whether he has missed either question. If he has, the computer gives him remedial items 3 and 4. If not, he goes directly to item 6 (representing a new topic).

On item 4 the correct answer, *b*, takes the student directly to item 6. Answer *a*, representing a particular type of error by the student, causes him to receive item 3 again. Answer *c*, another error, causes him to be given an extra remedial item, 5, before going ahead to item 6.

Item 12 represents a self-evaluation item, in which the student is asked how well he feels he is doing. Answer *a* (e.g., "I think I am doing well and would like to finish now") leads him directly to the end

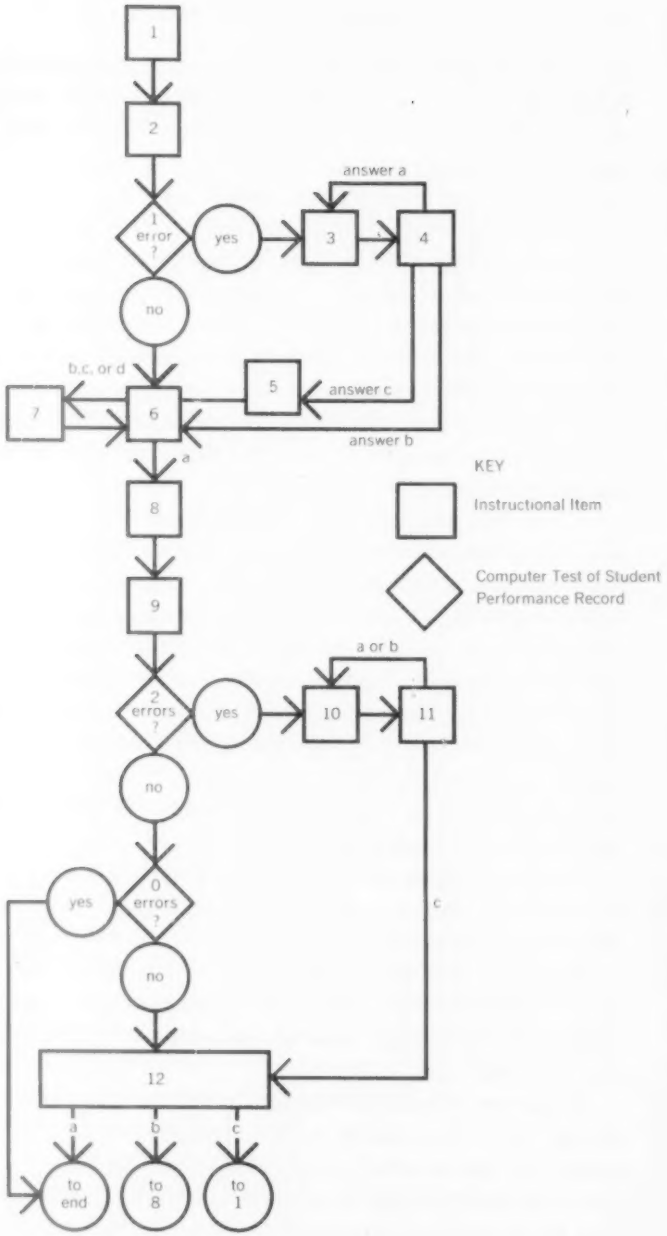

FIGURE 11. *Flow diagram showing types of decisions which the computer can be programmed to make during a lesson.*

of the lesson. Answer *b* ("I'm doing fine, but I would like some review") takes him to item 8 for a brief review of the materials. Answer *c* ("I don't understand this lesson at all") takes him back to the start of the entire lesson.

Experiments Completed

Following the development of the experimental teaching machine, research was started on a number of method variables, task variables, and student variables in automated teaching. The first study (4) investigated the effects of one form of machine responsiveness or branching, using over 400 items in logic. In this study the full capability of the automatic teaching machine was available. Thus a much more elaborate branching procedure was possible than that used in the previous studies with manual equipment.

It was hypothesized that the performance of students receiving a branching sequence would be superior to that of students receiving a fixed sequence, with respect to scores on a criterion post-test. In the branching group a student who had made errors on relatively difficult "main stream" items covering a topic was branched to a longer remedial list of simpler items covering the same topic. It was anticipated that by providing extra remedial items to students who had difficulty, the machine would minimize the number of items seen by the brighter student and the number of errors made by those with low aptitude. The over-all effect was expected to increase the amount of learning in a given time for each individual.

Student aptitude and training time as well as instructional materials were statistically equated for the two groups. With this design, obtained differences could not be attributed to differences in student scholastic aptitude, to amount of study time, nor to the different characteristics of the materials that were presented to the two groups, but only to the responsiveness of the machine to student errors when branching to remedial material.

Mastery of the topics covered by the training items was tested immediately after the training session. Analysis of the test scores yielded no significant difference between the two groups. Several factors indicated that this finding resulted from the particular method of branching used and from the inadequacy of the remedial items. Detailed analysis of item errors showed that the low aptitude students who received remedial materials did not benefit from them since they committed the same

kinds of errors on the remedial materials as on main-stream items. The branching procedure also permitted only one trial through the items, so that even if the student still did not understand the topic after completing the remedial items he was sent on to the next topic. In addition, the remedial items differed from the main-stream items only in the size of step or difficulty level, rather than in the approach used to cover the topic.

Another experiment (3), this one using manual equipment, compared an *optional* branching procedure with the fixed sequence method. Whereas the previous study used branching which depended on student response errors, this study was designed to evaluate a procedure in which the student was allowed to branch at his own discretion. Three groups of high-school seniors were drawn from five schools. The first group received a set of teaching items in fixed sequence. Students in this group read each item in turn and were not permitted to view items already completed. Students in the second group received the same items as those in the first group but were permitted to back up one item at a time and review previous items that had already been covered. The third group received a five-page, single-spaced test consisting of the same materials presented to the other two groups, except that teaching items were cast into statement form and organized into paragraphs. Members of the third group were permitted to branch at their own option either to earlier material or ahead to material not yet covered. Mastery of the topics was tested immediately after the training session. The analysis of test scores showed a significant difference between the optional branching group and the fixed sequence group in favor of branching.

Experiments Planned

Several experiments are now being planned for 1961. The logic items which were written for the branching-fixed-sequence study are now being revised and the program structure extensively modified for another experimental attack on this problem. The branching decisions will be made not only on the basis of errors but also on the basis of student response time and self-evaluation. If a student takes too much time on certain topics or feels that he needs some review, extra remedial items will be presented to him. A much greater variety of approaches will be used in the remedial items and students will be halted until they have satisfactorily learned each topic.

Another study being planned will not use the computer-controlled machine. One group of students will be required to give overt responses to instructional items presented manually. Students in a second group will receive the same materials, but cast in the form of statements; members of this group will not be required to give an overt response nor permitted to branch among items. A third group will receive the same materials and conditions as the second group except that branching will be encouraged. Learning will be compared for the three conditions. This design is expected to provide some clarification of recent conflicting evidence concerning the relative effectiveness of these methods.

SDC is planning a third project to develop an extensive sequence of items in high school mathematics using the computer-controlled teaching machine. These items will be used in an experiment in a number of high schools to answer certain practical questions concerning the application of auto-instructional methods in the public schools. The study will not be primarily concerned with the general question of whether auto-instructional methods teach, but with a determination of the kinds of students and the kinds of materials for which these methods are most effective. It will use two types of materials: rote and conceptual. The rote material will require specific definitions and memorization of factual detail. The conceptual material will require a progression of thought leading to principles which generalize to novel problem situations. Three kinds of students will be used: over-achievers, normal-achievers, and under-achievers. The results of this study should yield valuable information on methods of applying different self-instructional materials to students of different motivational characteristics. It is expected that when conventional teaching methods are used, over-achievers will perform better than under-achievers on rote materials which have little intrinsic appeal. On the more interesting conceptual topics, little difference is expected between the two groups. When self-instructional materials are used to supplement the regular instruction, it is expected that performance for under-achievers and over-achievers will be essentially equated as the result of elimination of motivational differences between the two groups. This equating of performance is expected for both rote and conceptual materials. The net effect of auto-instruction is expected to be greater for under-achievers than for over-achievers on rote materials, but no different for the two groups on conceptual material.

Future Developments

The computer-controlled teaching machine presently used at SDC can teach only one student at a time. Plans are now being developed for an expanded facility, using a larger computer control unit, that will give automated instruction to 20 students simultaneously. The same facility will provide automatic storage, analysis, and printout of administrative and counseling data normally associated with an operational school system. Development of the facility will permit the study of important interactions among students, teachers, and school administrators.

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Tempt Me Not With Your Gold, Fine Sir

An imaginary dialogue between
a reluctant researcher and an eager sponsor

EDGAR CRANE AND
MALCOLM S. MACLEAN, JR.*

TO THE NEIGHBORS, the marriage between the practical man of affairs and the researcher appears to be placid enough, although the absence of visible progeny as a result of their union may sometimes cause gossip as to their real compatibility.

A monkish cult in some academic circles goes so far as to insist that celibacy is the proper state of a researcher; all money, they say, tends to corrupt and the research buyer's gold represents the primrose path to perdition. Other researchers languish in ivory towers, waiting for a pure-minded Foundation to ride by and throw undesignated funds into their chamber window. Still others marry a sponsor, planning to reform him after the marriage price is paid, certain they know what is best for both of them.

Even the researcher firmly committed to the idea that marriage is a partnership occasionally wonders why he so seldom hears of any research findings actually being put to use by the man who paid for them. More often than not he concludes that researchers generally don't take the trouble to communicate their results successfully, and goes back to dreaming up a new appeal for more funds.

* The authors are associated with the Communications Research Center at Michigan State University.

The buyer, on his part, seems to be long suffering, with such inferiority feelings about statistics and the like that he blames his own stupidity for failing to understand what appears to be doubletalk or begins to apologize for corrupting the pure minded researcher with anything so crass as money.

A hard-headed study of the liaisons between sponsor and researcher, we believe, would often show that the two had rushed blithely into marriage knowing next to nothing about one another, then lapsed into a state of boredom and indifference, never understanding how they got there.

In the interests of both parties, we would urge that every research grant carry, as a kind of caboose, an auxiliary grant for a follow-up study of the sponsor's actual use of the research findings.[1] In most cases, we suspect, there would be none, because neither partner really understood the other before the banns were posted, or because whatever common interests originally existed disappeared in the course of the study.

The researcher, typically, is interested in the judgment of his peers—his standing with other researchers. All too often he lives in an environment where he must publish or perish; and sponsor's dollars buy the assistants, the subjects, the IBM cards, and the computer runs which lead to publications. The sponsor seldom asks "So what?" and if he does the woods are full of sponsors who surprisingly often can be convinced that for them to ask how findings may be used is to show a short-sighted interest in trivia compared with the researcher's fundamental, scientific concerns.

But to some extent all researchers tend to be prisoners of their techniques. We begin with a desire to explore some phenomenon and end up by studying what our techniques and standards of proof permit us to.

One can argue that no marriage, including that of sponsor and researcher, would ever occur if the parties really understood one another. We would argue, however, that fruitful marriages are most likely if there is a considerable area of overlap to begin with, as well as awareness of the basically different needs of each partner.

Some persons argue that man is basically polygamous, and woman

[1] Sidney S. Goldish, research director for the *Minneapolis Star and Tribune*, remarks in the Summer 1960 issue of the *Journalism Quarterly:* "The costs of every study we make are assigned directly to the department for which the study is made. That is one way of making reasonably sure that a study, once completed, will be put to use—not pigeonholed."

monogamous. Similarly, the sponsor typically is interested in multivariate situations rather than the "rigor" and "purity" of the simpler situations preferred by the researcher. The sponsor often is interested in a rough-rule of thumb that holds across a variety of conditions, and the researcher in the precision that comes with very specific conditions.

Few sponsors would subsidize research unless they thought their interests overlapped with those of the researcher. Even when such overlap is real rather than apparent at the time a grant is made, it may vanish in the course of the study. For research has laws of its own and decisions must be made almost daily which may change the direction of a study. The longer a study lasts and the more complex its design, the more likely such changes are to occur. When the changes are made they will be made by a researcher, who, as he makes them, has not the sponsor, but his fellow researchers looking over his shoulder. And so, imperceptibly perhaps, research drifts away from usefulness to the sponsor.

There are practical reasons why these circumstances are unfortunate. They are likely to destroy a continuing relationship between sponsor and researcher. Studies that cumulate over time often contribute more than those that do not, and a continued relationship depends upon both parties getting something out of it. To study such cumulative effects in the mass media requires the cooperation of the sponsor in producing the stimuli. Moreover, understanding of the sponsor's practical problems may challenge the researcher to develop new research techniques and so advance science in the course of serving a practical need.

How can this be done? First, there must be clearer recognition of the need for specification of areas of overlapping or complementary interests. Then the researcher must see that such overlap is preserved despite changes forced upon him by the demands of the research project as it is carried out. Finally, sponsor and researcher together must work out ways in which research findings can be applied, and observe whether, how much, and in what ways the findings are not useful. The doctrine of "caveat emptor" is no more justified in the sale of research (although more widely practiced there) than it is in our economic life.

Before accepting sponsor's gold, the researcher might well conduct a debate with himself, playing roles of both sponsor and researcher—a debate in which he tries as hard to *turn down* the proffered funds as most of us try to get them. Here's a sample of what we mean:

RESEARCHER: I'm interested in studying the effects of the mass media. You say you'd like me to measure the effects of educational TV for you. It sounds as if we were in perfect agreement. But let me ask a few questions to see whether words mean the same things to both of us. For example—are you interested in the effects of educational TV on children? (No, just adults.) Broadcast or closed-circuit? (Broadcast.) On all channels? (No, on educational channels only.) Include local and live programs? (No, just kinescopes.) Offer rewards such as credits and degrees which are extrinsic to the programs? (No.) In short, you are interested only in part of what is called educational TV and only part of its audience. I'm still interested, so keep talking.

SPONSOR: I want to know about my audience: how many folks watch my programs. Maybe how much they like what they see. Oh yes, and something about how much education they have and even what their incomes are.

RESEARCHER: Frankly, that doesn't sound very interesting to me. If you were a commercial station it might make some sense. That is, if your channel got a big share of the audience, you could always use this to find advertisers. But where does your money come from?

SPONSOR: From the public, from taxes, and from big foundations. I must admit that so far they haven't showed a lot of concern about audience size.

RESEARCHER: To what will you compare your audiences? Does it make sense to compare your programs with *Gunsmoke?* Or should you be comparing your audiences with those of a magazine like *Harper's* or a night school class in aesthetics? It seems to me that it depends on who your rivals are in seeking funds and whether you have to convince them that you reach an audience no one else can, or have a bigger effect, or a different effect on a given audience than your rivals. You already know that your audience isn't very big and, as you said, up to now at least the people from whom you get money don't seem to judge your effectiveness on sheer numbers.

SPONSOR: That's true, but can I count on that? What I'd really like to do is find some way to boost my audience, and then measure it. Can you help me do that?

RESEARCHER: It's possible. But which do you want to do—get persons who never watch your programs to watch them occasionally or get those who already view it to watch it more often? Frankly, I suspect the latter will be a lot easier.

SPONSOR: Ideally, we'd like to have everybody watch us some of the time, even if it were only 15 minutes a week. Most of us in this business feel we have an obligation to the entire public, and not just to an intellectual elite.[2]

RESEARCHER: Now this is beginning to sound interesting. We can do a couple of things for you. We can find out who's out there at 9:15 a.m. on Tuesday or 2:20 p.m. on Thursday, and whether they're washing clothes or gossiping over the

[2]In a survey made by the Communications Research Center, Michigan State University, of executives of educational TV channels, 78 percent said the ETV schedule should have something for everyone; 61 percent of community leaders agreed with them. See *Rating Scales, Program Types and Audience Segments* by Malcolm S. MacLean, Jr. and Edgar Crane, p. 16.

back fence.[3] Of course, the results may indicate that at such times they're more interested in radio than TV or that there are so few people available that you might as well go off the air.

SPONSOR: Well, I can't see that results like that would help me very much. Can't you do anything to boost my audiences?

RESEARCHER: Perhaps, provided we find who's out there and what rival activities you have to win them away from.[4] Suppose we forget about audience surveys and run some field experiments. We might find out that the most effective way to reach an audience is by writing letters to people, by giving lectures, by showing samples of your programs to women's clubs, or by getting the neighborhood kaffeeklatsches to talk about them instead of some political candidate.[5]

SPONSOR: That sort of thing might be useful if I were running a station. My job, though, is to turn out programs that will appeal to people.

RESEARCHER: Then an audience survey won't be much help to you. You aren't interested in finding out how big your audience is after housewives have been pulled out by an 8 to 5 working day, preparation of meals, and crying babies. Right?

SPONSOR: That's right. Just tell me what kinds of programs will appeal to what kinds of people.

RESEARCHER: Last year we did something of that kind. We showed programs to people and fed the results into a computer. It told us which package of programs would attract the most different people—sets of programs each of which appealed to a different set of people.[6]

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[3]A study of diaries kept by 523 Wisconsin farm families in February and March of 1957 found most radio listening was by women and in combination with another activity, with peaks between 6 and 8 a.m., and between noon and 1 p.m.; their husbands had another peak from 6 to 7 p.m. TV use was not combined with other activities and was highest between 6:30 and 9:30 p.m. See John E. Ross and Lloyd R. Bostian, *Time Use Patterns and Communications Activities of Wisconsin Farm Families in Wintertime* (Department of Agricultural Journalism, University of Wisconsin).

[4]A re-analysis of farm and town housewives' diaries originally collected by Alice C. Thorpe at Michigan State University is currently being directed by the senior author. Activities of housewives are classified as to the amount of attention they leave available for the media. Data indicate that farm housewives are most available at mealtimes.

[5]Can a group influence an individual to watch TV when he is home, away from the group? Research indicates that group consensus, real or perceived, and the making of decisions is likely to be followed by individual behavior of the desired sort. Public announcement of decisions or discussion in a group is apparently not necessary to get individual behavior. See Edith Bennett Pelz, "Some Factors in 'Group Decision'" in Eleanor E. Maccoby, Theodore M. Newcomb, and Eugene L. Hartley, *Readings in Social Psychology*. New York: Henry Holt and Co., 1958.

[6]MacLean and Crane (*op. cit.*) report results of a computer program developed at Michigan State University which, given audience response at previews, will suggest sets of programs which will maximize either the total number of persons likely to watch the set of programs or the total number of different persons which a set of programs will attract. One set of NETRC programs—on the U.N., pregnancy, and perception—attained 71 percent of "total exposure," defined as every viewer watching every program. Another set of programs—on the Middle East, social work, and opera—attained only 20 percent of total exposure. Of 44 persons studied, all but five would have been reached by the first package: 13 by all three, 22 by two, four by one. Half of this same group would watch the second set, but only four of them would watch more than one program.

SPONSOR: That might be some help to a station manager who draws up program schedules. That's not what I do. I produce the programs themselves.

RESEARCHER: So you want to know how many different topics you must use to appeal, in toto, to the entire population? I take it that you're not interested in appealing to a lowest common denominator by programs that *merely* entertain.

SPONSOR: That's part of it. I'd also like to know what to do within each program —which kind of performers to use, and whether a panel discussion is better than a lecture, and things like that.

RESEARCHER: Suppose we do this. Suppose we come up with a set of program categories[7] based on the way people actually behave, not how you or I think they ought to behave. And suppose we match these with a set of people categories.[8] Then you can tell that Categories II and VI of programs—say music and art—will reach Categories A and D of people—say a large group of clubwomen and a small group of men who play in chamber music groups. Then you can say ahead of time just who your potential audience is apt to be for any given program.

SPONSOR: Sounds fine. How much shall I make my check out for—and how soon can you have the results?

RESEARCHER: That's hard to say. I'm just talking off the cuff now, mind you, but I'd say maybe in 10 years and I wouldn't want to do more than suggest a two-or-three-year budget at first. Remember, we don't know what we're getting into. Before you write out a check let me ask a few more questions. We may discover, for example, that every time you want to develop people categories you have to bring them into the laboratory and show them program samples, or go door-to-door and get them to check lists of program types for you. On the other hand, we may be lucky, and find that the important categories are based on the kind of facts you find in census reports. As for program types, we may find that these are big, simple categories such as natural sciences and fine arts. Or maybe they are real complicated categories such as three women and one man in a panel discussion of ancient history or a set of film clips on aid to refugees.

SPONSOR: But I need a few simple rules that I can give my script writers and cameramen—like a cookbook that tells you how to make a ragout or a soufflé.

RESEARCHER: I'm not sure we can come up with anything like that. Even if we could, are you sure your creative people could use any such rules? Maybe what we

[7] After viewing four-minute samples of actual NETRC programs, subjects representing a cross-section of the Lansing, Michigan population rated them on adjectival scales. Factor analysis of these results, reported by MacLean and Crane (*op. cit.*) showed that the usual subject matter divisions of physical sciences, social sciences, humanities, and fine arts were not sufficient. Instead categories such as public affairs, self-improvement, and traditionalism were used, in addition to science and art. Even when relatively homogeneous programs were used, such as a set of 13 music programs, such different kinds of audiences as music students, members of child study clubs, and book discussion groups disagreed on the appropriate categories.

[8] When responses to a checklist of 28 program types offered on commercial TV were analyzed, MacLean and Crane (*op. cit.*) found that their 90-some subjects divided into nine different types. The 45 men in the group fell into two major classes: those who liked civic and foreign affairs programs and most entertainment programs and those interested in only four of the 28 categories: news, farm programs, sports, and variety shows. Women, however, separated into seven different categories.

ought to do for you is follow some of them around for a year or so, watch them make decisions, see what assumptions underlie these decisions, and then go out and test these assumptions for you.

SPONSOR: Sounds like a boondoggle to me. Is that all you have to suggest?

RESEARCHER: Well, I think we've made progress, even if it's only to decide that we can't do anything that you need done. Suppose we begin all over again. I've been bothered by this idea of educational TV. Is it possible? Can education in the sense of a process with effects measurable by my research techniques occur over TV? Education depends on delayed rewards but people may turn the set off unless they get immediate rewards, too.

SPONSOR: You must admit there have been lots of studies of classroom instruction by radio, film, and TV!

RESEARCHER: Yes, but remember the differences. Your kind of TV is something shown to adult audiences, who can switch the set off as youngsters in the classroom cannot. You don't offer them credits and degrees for watching. If your program is educational, it should make them work at watching—and how many people are willing to do that?

SPONSOR: Not everyone, I'll admit. But can't education be entertaining?

RESEARCHER: Perhaps it can entertain, but by definition it has to do more. If people are to learn, then they've got to exert some effort, and they've got to be willing to expose themselves to something new. What's more, either the programs have got to get harder and harder as you go along, or you must keep bringing in a new audience all the time. At least, I feel that effective education has got to produce learning, and learning requires effort. What's more, it has to be aimed at a pretty specific audience. A program can't teach much if viewers (a) already know what it has to say, or (b) don't have enough background to understand what it's saying. If you begin to really teach people, you may find your audiences getting smaller rather than larger. In fact, you may have to deliberately discourage people not in your target audience from viewing programs not aimed at them!

SPONSOR: Facts aren't all there is to education. I'd like to change attitudes, for example. When I produce an art or music program, I'm trying to raise the general level of cultural taste. Can't you measure that?

RESEARCHER: Give me time and money enough and I can probably measure anything. The chances of proving that educational TV has had a measurable effect in raising the level of taste don't seem too good, when you think of all the other factors contributing to this result. If your aim is to improve taste, by which I suppose you mean bringing the public into closer harmony with the views of some set of "experts," maybe your money ought to go elsewhere. At the very least, you ought to be concerned about whether educational TV efforts in this direction are coordinated with those of other forces.

SPONSOR: I agree that it's pretty hard to measure a thing like taste. How about increasing the viewer's sense of civic responsibility? Isn't that a worthwhile aim?

RESEARCHER: I'm not arguing about what's worthwhile and what isn't. I'm talking about what we can measure for you, and whether the figures we get will be any use to you after you get them. Suppose we find, for example, that the most efficient way to increase voting, participation in party politics, and activity in voluntary organizations—all of which I suppose are included in what you term a "sense of civic responsibility"—is by reaching an elite and letting them pass the message on to the general public. Is open broadcast TV the most efficient way of reaching them? It looks to me as if direct mail, face-to-face meetings, restricted-circulation magazines, or closed-circuit TV might be more appropriate.

SPONSOR: TV might have a part to play in reaching the public directly?

RESEARCHER: But is it the most efficient way? Suppose we admit that face-to-face contacts are needed to get people active in civic affairs, but that educational TV can help. Then it seems to me we can be sure that TV can't be effective unless there is also face-to-face contact in the broadcast area, and that if there is face-to-face contact, it's going to be hard to show how much of the results educational TV can take credit for. You see, if you're interested mainly in effects, our research may discover that where changes are really needed is not in your programs but in all the other kinds of action that need to go along with the programs.

SPONSOR: But all I'm interested in is in producing more effective programs.

RESEARCHER: I suppose so. But are you really interested in research? So far as I can tell you don't need it and can't make use of it and it would be dishonest to take your money.

SPONSOR: Oh, have some anyway; it has to be spent.

Recognition Learning under Multiple Channel Presentation and Testing Conditions

FRANK R. HARTMAN

The research reported here was conducted while the author was a member of the staff of the Division of Academic Research and Services of the Pennsylvania State University under a grant from the Television Bureau of Advertising of New York. Mr. Hartman wishes to acknowledge the contributions of John Hundleby of the Division's staff who read the manuscript in its entirety and made many helpful comments. Acknowledgment is also given to Dr. C. R. Carpenter and Mr. Leslie P. Greenhill, director and associate director, respectively, of the Division for their support and encouragement. Mr. Hartman is currently a member of the faculty of Dickinson College, Carlisle, Pennsylvania.

THIS PAPER IS A REPORT on a series of experiments which investigated the relative success of two hypotheses in predicting differences in the amounts of learning when information is presented over single and multiple communication channels.

The two hypotheses were:

1. Multiple channel presentations do not produce more learning than single channel presentations unless the situation in which the learning is elicited also contains the additional cues.

2. Redundant information simultaneously presented by the audio and print channels is more effective in producing learning than is the same information in either channel alone.

The experiments were designed to obtain maximum relevance to television with regard to the multiple channel problems investigated and to the choice of the specific channels utilized.

A televised communication can be logically divided into a pictorial and a verbal message. The verbal message can be conveyed by either sound or print or both. Regrouping these divisions we have three

channels: a verbal-audio channel, a verbal-print channel, and a pictorial channel. For the purpose of less cumbersome classifications the channels may be renamed audio, print, and pictorial, respectively.

With multiple channels available for the presentation of information there are numerous possibilities for their utilization. A single channel may be used, or two or more channels in simultaneous operation. Channels and channel combinations may also be alternated. If multiple channels are utilized simultaneously, they may present *redundant* information such as a word, spoken and printed, or they may present *related* information such as a pictorial representation of an object and the word for that object. The information may be *unrelated* such as a picture of a tree and the digit *9*, or it may be *contradictory* such as the simultaneous presentation of the printed word, *woman*, and the spoken word, *man*.

The most typical situation encountered in educational and commercial televised communication is that in which channels are used simultaneously to present redundant or related information. It is with this situation that the experiments described in the following paragraphs are concerned. The information chosen for presentation is a picture of a person and a fictitious name given aurally and visually. Presented simultaneously, this results in redundant information in the audio and print channels, and related information in the pictorial channel.

Further considerations in this choice of information or subject matter for the experiment are: (a) the pictorial and linguistic surrogates of objects form functionally related units of information and constitute a substantial percentage of day-to-day media communications, and (b) unfamiliar human faces and fictitious names have relatively low prior associations. This is highly desirable for the experiment since extraneous prior associations would result in contraditory information between the pictorial and verbal channels rather than the desired condition of related information.

Recognition or discrimination learning was chosen for the test of the acquisition of information. Alternatives were recall and serial anticipation recall. However, both alternatives require the subject to reproduce some representation of the information which has been presented him. A contrary requirement for the experiments was that the learning should be testable in the same channels as those in which it was originally presented. This meant that recall testing would require the subjects to reproduce the pictorial stimuli, an implausible if not impossible

task. With recognition learning, the previously presented information had only to be imbedded in similar material not previously exposed. Such a test was practical for pictures as well as words and proved highly satisfactory.

The resulting experimental pattern is the presentation of names and faces singly and simultaneously over three communications channels and tested for learning in any channel or combination of channels. The possibilities for investigation are presented in Table 1.

TABLE 1--POSSIBLE PRESENTATION AND TESTING COMBINATIONS FOR INFORMATION PRESENTED OVER COMBINATIONS OF THREE CHANNELS

	Presentations						
Tests	*Audio*	*Print*	*Pictorial*	*Audio and Print*	*Audio and Pictorial*	*Print and Pictorial*	*Audio and Print and Pictorial*
Audio	x	x	—	x	x	x	x
Print	x	x	—	x	x	x	x
Pictorial	—	—	x	—			
Audio and Print	x	x	—	x	x	x	x
Audio and Pictorial	x	x	x	x	x	x	x
Print and Pictorial	x	x	x	x	x	x	x
Audio and Print and Pictorial	x	x	x	x	x	x	x

As can be seen from Table 1, there are theoretically 49 presentation-testing possibilities for the three-channel communications situation. Six of these are implausible and are indicated in Table 1 by dashes because they involve the testing of verbal presentations on the pictorial channel, or vice versa. All of the remaining 43 possibilities have been studied during the course of the three experiments described in the following paragraphs.

The first experiment is concerned solely with the single-channel problem and examines the outcomes of the seven presentation possibilities tested in all plausible single channel situations. The second experiment deals with the results obtained in three-channel testing, and the third involves the three double-channel possibilities: audio-print, audio-pictorial, and print-pictorial.

The major interest of these studies concerns the differences in amount of recognition produced by the 43 presentation-testing conditions which have been grouped for experimentation into single-, double-, and triple-channel testing situations. Two theoretical positions have been uncov-

ered which predict some if not all aspects of the outcome. The term "theory" shall be applied although the theories so designated are rather simple empirical generalizations. These theoretical positions may be termed:

1. *Cue summation theory.* Stated in a number of different ways, this predicts, essentially, that learning of discriminations is increased as the number of available cues or stimuli is increased. The theory has been cited numerous times to assert the supremacy, as conveyers of information, of motion pictures and television communication over other media. Supporting evidence from studies of the audio and print channels, singly and in combination, have been offered in numerous reviews of the literature such as the survey by Day and Beach (4). Hoban and Van Ormer (9) cite studies by Nelson (21) and Nelson and Moll (22) which indicated that pictures added to auditory material were more effective than auditory material alone. Bousfield, Esterson, and Whitmarsh (2) obtained successive increases in the learning of a list of verbal surrogates of objects by adding black and white, and then colored, pictorial surrogates of the objects.

2. *Stimulus generalization-iconicity theory.* An approximate statement of this position is that learning of presented information increases as the testing situation becomes more similar to the presentation situation. Morris (17:23) noted that "a sign is *iconic* to the extent to which it itself has the properties of its denotata; otherwise it is non-iconic." Carpenter (3:41) states a *"sign similarity hypothesis:* that films whose signals, signs, and symbols have high degree of similarity ('iconicity') to the objects and situations which they represent will be more effective for most instructional purposes than films whose signals, signs, and symbols have low degrees of 'iconicity'." Gibson (8) distinguishes between *conventional surrogates,* arbitrary words or linguistic symbols, and *non-conventional surrogates* such as pictures whose relation to their referents depends upon physical stimulus similarity.

The relation of these formulations to the presentation-channel testing-channel problem was anticipated by Elliott (5) who used audio and print channels to test audio and print presentations and by Roshal (23). Roshal formulated the approximate statement given earlier, noted the derivation from stimulus generalization theory, and demonstrated that more successful knot tying could be achieved if training films were made from the subject's viewing angle than from any alternative camera position. The work of Roshal was followed by Kale (10) who was

unsuccessful in his attempt to demonstrate that action pictures are more satisfactory illustrations than still pictures for lists of verbs, and still pictures more satisfactory for nouns. Further work by Lefkowith (13) confirmed the stimulus generalization-iconicity hypothesis within the pictorial representation area. Lefkowith showed that a line drawing presentation led to better results on a line drawing test, and that still pictures surpassed line drawings when the results were measured by still pictures. Lefkowith further demonstrated that scores on the still picture test were more highly correlated with performance test scores than line drawing scores. Differences among means on the performance test were in the expected direction but not significant.

Finally, Bern (1), apparently working independently, noted the presentation-channel testing-channel problem and recommended *recognition* as one testing solution and certain musculature measurements as another. The results of Bern's study will not be considered here since his interest was association rather than discrimination learning.

As formulated, the cue summation and stimulus generalization theories make somewhat divergent predictions concerning the amounts of learning to be achieved by various presentation-channel testing-channel combinations. According to the cue summation theory, learning will increase with the addition of channels. The stimulus generalization-iconicity theory would predict that maximum learning for any combination of testing channels will be highest when the presentation situation is identical with the testing situation. Thus when all possible combinations of three channels are tested on the audio channel, the cue summation theory would seem to predict that the combination of audio, print, and pictorial would yield the highest learning while the stimulus generalization-iconicity theory indicates that maximum learning should occur for the audio-presentation channel alone.

With further consideration, however, the discrepancies between these two positions may be shown to vanish. The argument is based on the writing of Miller (16). The cue-summation hypothesis applied to discrimination may be expressed as follows: If one stimulus complex is to be distinguished from another, the subject may use any of a number of cues or stimuli in which the complexes differ to make a discrimination between them, although a single cue is obviously sufficient. Increasing the number of cues increases the likelihood of a single subject's making the correct discrimination over a period of time, and of a higher percentage of subjects making the discrimination simultaneously. The more

handles there are, the easier it is to find one particularly suited to a given individual. In the experimental pattern to be investigated, one presentation may be remembered by certain subjects because of the distinctiveness of the face, while for others it is the character of the name which stands out. However, as Miller points out, it would be a mistake to *assume* that any cue will produce a summation effect when added to another cue. A cue may distract or elicit competing responses, producing a reduction rather than an increase in learning.

Likewise the stimulus generalization-iconicity theory may be reduced to similar sets of concepts. Stimulus generalization is an empirical observation that similar stimuli tend to evoke similar responses. A research problem still not solved is the specification of the nature of the similarity between multi-dimensional stimulus complexes. The position advanced here is similar in some respects to that of Estes. Generalization between two simulus complexes is a direct function of the number of cues which they possess in common. The argument is identical with that used for the cue summation theory. Other things being equal, the greater the number of cues held in common by two stimulus complexes, the greater the probability that the cues (which elicit a response for a given subject to one stimulus complex) will also be present in the second and elicit a similar response.

Thus considered, the cue summation and the stimulus generalization-iconicity theories would seem to reduce to two sides of a coin. Together, they predict that an increase in the number of cues available in the presentation of information increases the recognition or discrimination of that information, *provided the cues are also available in the situation wherein the discrimination is tested*. This proviso was not given in the original statement of the cue summation theory, and it could be inferred that the addition of cues would increase discrimination regardless of whether or not they were present in the final test of discrimination.

Having reduced the two theories to one, it is now necessary to raise some objections to what is obviously an over-simplification. First of all, cues are not equal in their probabilities of eliciting responses. Some cues have a much higher probability of being used than others. Miller calls such cues *relevant cues*, and those which have little probability of being used, *irrelevant cues*. It can also be demonstrated, as has been previously noted, that certain cues are capable of producing interference with learning. Furthermore, even with cues whose probabilities of evoking a desired response are approximately equal, the situation is

more complex than has been represented. French (6), for instance, has demonstrated that different percentages of reinforcement yield strikingly different amounts of generalization for stimulus complexes with identical percentages of cues in common. In the defense of the derived position, it must be said that relevant cues are very difficult to identify *a priori*, and the expectation of equal probabilities of effectiveness of cues when no prior information exists is probably a useful one in the long run.

Secondly, the criticism has been advanced that the original statement of the cue summation theory was in error because it failed to specify that additional cues in the presentation situation must also be present when the information is tested—if any increased learning is to be expected to result from the additional cues. This seems a very logical expectation. Unfortunately, some experimental data exists which is an exception to it. Experiments described in Day and Beach (4) consistently obtained an advantage for a redundant simultaneous audio and print channel presentation with single channel testing over either channel alone. McCormick (15), in his review of the literature on reaction time, has noted the same advantage for combined auditory and visual stimulation over either channel separately. This suggests a possible neurological explanation, but at present it must suffice to note a consistent exception to the general position outlined above.

Other exceptions occur. The previously mentioned increases in learning obtained by Bousfield, Esterson, and Whitmarsh (2) by adding pictorial to verbal surrogates involve single-channel testing. Such effects have been obtained in some (but not all) of the series of experiments originating with Gagne and Baker (7) wherein learned associations of verbal with pictorial cues enhanced later discrimination involving the pictorial cues in the absence of the verbal ones. Such effects have been observed in previous channel experiments and some possible association mechanisms have been postulated by Lumsdaine (14). Once again, it must suffice to note that exceptions may occur where association between information across channels is possible and that this is most likely when channels carry related information.

From the theoretical discussion above, the following hypotheses may be derived concerning the expected differences in amounts of learning among the 43 presentation testing combinations of three channels.

1. *For any given testing channel or combination of testing channels, the greatest recognition learning will occur when the presentation chan-*

nel or combination of channels is the same as the testing situation. This hypothesis is derived from the combined stimulus generalization-iconicity and cue summation theories, and is true only if there is little or no interference among channels. Since the information presented is either redundant or related, little interference is expected.

2. *Multiple channel presentations will be relatively more effective in multiple channel than in single channel testing situations and as effective as single channel presentations in single channel testing situations.* This hypothesis also derives from the resolution of the two theories and is in many ways an alternative statement of hypothesis number 1, and therefore not independent. It is also true only if there is minimal interference among channels.

3. *Presentations combining the audio and print channels will be more effective than presentations involving either channel alone.* This hypothesis is based on the well documented exception to the general theory and should hold in all testing situations involving one of the verbal channels.

Three experiments have been conducted to test these hypotheses. In the first experiment, all possible presentation-channel combinations were tested on the print, audio, and pictorial channels individually. The second experiment tested the same combinations on the combined audio, print, and pictorial channels. In the third experiment, the audio-print, the audio-pictorial, and the print-pictorial channels were used to test the presentations. Since the experimental design is essentially the same for all three experiments, a single description will suffice.

Design of the Experiment

Subjects: The subjects of the experiment were 1184 freshmen at the Pennsylvania State University, approximately three quarters of them male.

Materials: Seventy-five upper class students served as photographic subjects—36 women and 39 men. To increase the difficulty of the recognition task, clothing cues were eliminated by dressing the subjects in reversed raincoats. A five-second exposure on motion picture film was made on each subject. The shot was a head and shoulder portrait which filled the frame. During the exposure each subject raised his or her head, looked directly at the camera, and smiled. The motion was nearly uniform for all subjects. Seventy-five common Anglo-Saxon names of no more than medium length were chosen and randomly paired with

photographs of the 36 women and 39 men. Each name was printed on the lower portion of the frame and appeared simultaneously with the picture throughout the exposure. Synchronized with the pictorial and print elements was the voice of a professional announcer who spoke the name, paused one second, and then repeated it—a procedure which utilized approximately all of the five seconds available.

Twenty-five of these 75 information units were randomly selected, 12 women and 13 men. They were arranged in random order and constituted the *information presentation* series. The entire 75 units were also in random order and constituted the *information test* series. Both series were recorded on the same film. The task was to recognize which of 75 units had been included in the presentation series of 25.

Procedure: For each experiment the subjects were randomly divided among a series of classrooms containing television receivers. These rooms were standard television viewing rooms and had been checked previously for visibility and audibility. The presentation and testing series were presented by film over the television receivers. The seven channel combinations were achieved by modifying the receiving sets (turning off sound, turning off picture, blocking out the upper or lower portion of the picture). To achieve the presentation-testing channel combinations with a minimum number of rooms and proctors, each group of subjects for a particular combination of presentation channels was randomly subdivided according to the required number of testing channels. Following the information presentation series, each subgroup was sent to another viewing room where the appropriate testing-channel situation had been arranged. The time between end of presentation and beginning of test was four minutes. Following the test a few questions concerning number of prior associations and channel preferences were asked.

Experiment I

Results: Subjects were scored for the total number of correct discriminations out of 75 (it was necessary to designate correctly information units *not* previously included in the presentation series as well as units previously included). The mean scores for the presentation-testing channel combinations are given in Table 2.

The over-all tests of significance of the presentation channel means are given for each testing channel in Table 3.

TABLE 2—OBTAINED MEANS FOR SEVEN PRESENTATION COMBINATIONS OF THREE CHANNELS TESTED ON THE AUDIO, PRINT, AND PICTORIAL CHANNELS

	Presentation Channels						
Test Channels	*Audio*	*Print*	*Pictorial*	*Audio and Print*	*Audio and Pictorial*	*Print and Pictorial*	*Audio and Print and Pictorial*
Audio	59.45 (n=22)	59.52 (n=23)	—	60.64 (n=22)	52.63 (n=24)	56.91 (n=22)	57.78 (n=23)
Print	58.48 (n=23)	63.65 (n=23)	—	62.26 (n=23)	52.74 (n=23)	57.14 (n=22)	57.72 (n=25)
Pictorial	—	—	55.73 (n=22)	—	52.05 (n=22)	52.27 (n=22)	50.87 (n=22)

TABLE 3—ANALYSES OF VARIANCE OF PRESENTATION MEAN DIFFERENCES TESTED ON THE AUDIO, PRINT, AND PICTORIAL CHANNELS

Test Channels	*Among Samples Sum of Squares*	*df*	*Within Samples Sum of Squares*	*df*	*F*	*p*
Audio	965.36	5	6573.63	130	3.82	<.01
Print	1751.66	5	4709.45	133	9.89	<.01
Pictorial	292.12	3	3466.28	85	2.39	>.05

Since the over-all tests of the differences among the presentation means were significant for the audio and print testing channels, it was necessary to test individually the differences between each pair of presentation means within a testing situation. Two sample F tests were used for this purpose. The significance of these mean comparisons is reported in Tables 4 and 5.

Discussion: Tests of the differences among the means of the presentation channel combinations indicate that significant differences have been obtained in the audio and print testing channels but not in the pictorial testing channel. The nature of these differences must remain somewhat open to question since inspection of Table 2 indicates that interference occurred among the information in the three channels. If the relation between the pictorial and verbal channels had been one of non-interference, the addition of the pictorial channels to the presentation would neither add nor detract, and the results should be essentially similar to those obtained with the verbal presentations. This should also be true for the addition of the verbal channels to the pictorial presentation. The pattern of differences found in Table 2 indicates that the addition of the pictorial channel presentation resulted in a

TABLE 4—SIGNIFICANCE OF OBTAINED DIFFERENCES BETWEEN PAIRS OF PRESENTATION CHANNEL MEANS AS TESTED ON THE AUDIO CHANNEL ARRANGED IN DESCENDING ORDER OF MAGNITUDE
(Left to right and top to bottom)

	Print	*Audio*	*Audio and Pictorial and Print*	*Pictorial and Print*	*Pictorial and Audio*
Print and Audio	n.s.*	n.s.	n.s.	<.05	<.01
Print		n.s.	n.s.	n.s.	<.01
Audio			n.s.	n.s.	<.01
Audio and Pictorial and Print				n.s.	<.05
Pictorial and Print					n.s.

* n.s.—Not significant at or beyond the .05 level.

TABLE 5—SIGNIFICANCE OF OBTAINED DIFFERENCES BETWEEN PAIRS OF PRESENTATION MEANS AS TESTED ON THE PRINT CHANNEL ARRANGED IN DESCENDING ORDER OF MAGNITUDE
(Left to right and top to bottom)

	Print and Audio	*Audio*	*Audio and Pictorial and Print*	*Pictorial and Print*	*Pictorial and Audio*
Print	n.s.*	<.05	<.05	<.01	<.01
Print and Audio		<.05	<.05	<.01	<.01
Audio			n.s.	n.s.	<.01
Audio and Pictorial and Print				n.s.	<.05
Pictorial and Print					<.05

* n.s.—Not significant at or beyond the .05 level.

lower amount of learning. The majority of the obtained significant differences in pairs of means (see Tables 4 and 5) support this conclusion. The pattern of differences obtained in the pictorial testing channel also indicates interference, although only one of the paired mean differences (pictorial versus audio and print and pictorial) is significant.

The interference between names and faces was unexpected. The most likely explanation is that the difficulty of the information was so high that attention was divided and learning in both channels was reduced.

Since the hypotheses were postulated only under the expected condition of non-interference among information, the present experiment cannot be considered a sufficient test. The advantage of the pictorial presentation in the pictorial test is in accordance with the hypothesis, but the condition of interference between the pictorial and verbal information would lead to the same prediction. In the verbal tests, print does

better on print than all conditions excepting audio-print, as expected, but audio and print are not in the expected order on the audio test. By inspection the audio-print combined facilitation expected from hypothesis number 3 seems somewhat substantiated. This condition yields the highest mean on the audio test and is the most successful of the combinations with the pictorial channel when tested on the verbal channels. Although the audio-print presentation condition fails to surpass print on the print testing condition, it is considerably higher than audio and much closer to the very high print mean than any other condition.

Experiment II

Results: The means for the various presentation channel combinations tested simultaneously on all three channels are given in Table 6.

TABLE 6—OBTAINED MEANS FOR SEVEN PRESENTATION COMBINATIONS OF THREE CHANNELS TESTED SIMULTANEOUSLY ON THE AUDIO, PRINT, AND PICTORIAL CHANNELS

	Presentation Channels						
Test Channels	*Audio*	*Print*	*Pictorial*	*Audio and Print*	*Audio and Pictorial*	*Print and Pictorial*	*Audio and Print and Pictorial*
Audio and Print and Pictorial	56.18 (n=33)	59.09 (n=35)	51.36 (n=33)	61.24 (n=34)	58.15 (n=34)	57.15 (n=33)	62.18 (n=34)

The over-all test of significance of the presentation channel means is given in Table 7.

TABLE 7—ANALYSIS OF VARIANCE OF THE PRESENTATION CHANNEL MEAN DIFFERENCES TESTED SIMULTANEOUSLY ON THE AUDIO, PRINT, AND PICTORIAL CHANNELS

Among Samples Sum of Squares	*df*	*Within Samples Sum of Squares*	*df*	*F*	*p*
2576.96	6	8283.53	229	11.87	<.01

Since the over-all tests of the differences among the presentation channel means was significant, it was necessary to test individually the differences between each pair of presentation channel combination means. This is reported in Table 8.

Discussion: The audio, pictorial, and print presentations, in accordance with the hypothesis, produced the highest amount of recognition learning. Differences are significant for all but the comparison with the

TABLE 8—SIGNIFICANCE OF OBTAINED DIFFERENCES BETWEEN PAIRS OF PRESENTATION MEANS TESTED SIMULTANEOUSLY ON THE AUDIO, PRINT, AND PICTORIAL CHANNELS AND ARRANGED IN DESCENDING ORDER OF MAGNITUDE (Left to right and top to bottom)

	Audio and Print	*Print*	*Pictorial and Audio*	*Pictorial and Print*	*Audio*	*Pictorial*
Audio and Pictorial and Print	n.s.*	<.05	<.01	<.01	<.01	<.01
Audio and Print		n.s.	<.05	<.01	<.01	<.01
Print			n.s.	n.s.	n.s.	<.01
Pictorial and Audio				n.s.	n.s.	<.01
Pictorial and Print					n.s.	<.01
Audio						<.01

*n.s.—Not significant at or beyond the .05 level.

print presentation. As predicted, the verbal-pictorial combinations do better relative to the single channel presentations under verbal-pictorial testing conditions although the differences are not significant except for the comparisons with the pictorial presentation. The addition of the pictorial channel to the verbal channels produces an advantage over two of the verbal channels—audio-print and audio—but not over print.

The strong superiority of the two audio-print presentations offers further support for hypothesis number 3. The print channel, however, continues to be more successful than expected.

Experiment III

Results: The means for the various presentation channel combinations tested on all combinations of *two* channels are given in Table 9.

The over-all test of significance of the presentation channel means is

TABLE 9—OBTAINED MEANS FOR THE SEVEN PRESENTATION COMBINATIONS OF THREE CHANNELS TESTED ON ALL POSSIBLE PAIRS OF THREE CHANNELS

	Presentation Channels						
Test Channels	*Audio*	*Print*	*Pictorial*	*Audio and Print*	*Audio and Pictorial*	*Print and Pictorial*	*Audio and Print and Pictorial*
Audio and Print	59.40 (n=30)	59.47 (n=30)	—	63.13 (n=31)	53.48 (n=31)	56.32 (n=28)	55.34 (n=55)
Audio and Pictorial	60.03 (n=31)	61.11 (n=27)	55.47 (n=30)	61.72 (n=25)	60.21 (n=29)	59.17 (n=30)	62.15 (n=27)
Print and Pictorial	56.78 (n=29)	59.94 (n=29)	53.35 (n=29)	63.96 (n=30)	57.77 (n=29)	59.66 (n=30)	61.31 (n=30)

TABLE 10—ANALYSIS OF VARIANCE OF PRESENTATION MEAN DIFFERENCES TESTED ON THE AUDIO-PRINT, AUDIO-PICTORIAL, AND PRINT-PICTORIAL CHANNELS

Test Channel Combinations	*Among Samples Sum of Squares*	*df*	*Within Samples Sum of Squares*	*df*	*F*	*p*
Audio-Print	1852.43	5	7354.55	173	8.72	<.01
Audio-Pictorial	867.85	6	6716.49	192	4.13	<.01
Print-Pictorial	1970.46	6	8060.71	199	8.11	<.01

given for each of the double channel testing combinations in Table 10.

Since the over-all tests of the differences among the presentation means were significant for all three testing situations, it was necessary to test individually the differences between each pair of presentation means within a given testing condition. The significance of these comparisons is reported in Tables 11, 12, and 13.

TABLE 11—SIGNIFICANCE OF OBTAINED DIFFERENCES BETWEEN PAIRS OF PRESENTATION MEANS AS TESTED ON THE AUDIO-PRINT CHANNEL ARRANGED IN DESCENDING ORDER OF MAGNITUDE
(Left to right and top to bottom)

	Print	*Audio*	*Pictorial and Print*	*Audio and Pictorial and Print*	*Audio and Pictorial*
Audio and Print	n.s.*	<.05	<.01	<.01	<.01
Print		n.s.	n.s.	<.05	<.01
Audio			n.s.	<.05	<.01
Pictorial and Print				n.s.	n.s.
Audio and Pictorial and Print					n.s.

* n.s.—Not significant at or beyond the .05 level.

TABLE 12—SIGNIFICANCE OF OBTAINED DIFFERENCES BETWEEN PAIRS OF PRESENTATION MEANS AS TESTED ON THE AUDIO-PICTORIAL CHANNEL ARRANGED IN DESCENDING ORDER OF MAGNITUDE
(Left to right and top to bottom)

	Print	*Print*	*Audio and Pictorial*	*Audio*	*Print and Pictorial*	*Pictorial*
Audio and Pictorial and Print	n.s.*	n.s.	n.s.	n.s.	n.s.	<.01
Audio and Print		n.s.	n.s.	n.s.	n.s.	<.01
Print						<.01
Audio and Pictorial				n.s.	n.s.	<.01
Audio			n.s.	n.s.	n.s.	<.01
Print and Pictorial					n.s.	<.05

* n.s.—Not significant at or beyond the .05 level.

TABLE 13—SIGNIFICANCE OF OBTAINED DIFFERENCES BETWEEN PAIRS OF PRESENTATION MEANS AS TESTED ON THE PRINT-PICTORIAL CHANNEL ARRANGED IN DESCENDING ORDER OF MAGNITUDE
(Left to right and top to bottom)

	Audio and Pictorial and Print	*Pictorial and Print*	*Print*	*Pictorial and Audio*	*Audio*	*Pictorial*
Audio and Print	n.s.*	<.05	<.05	<.01	<.01	<.01
Audio and Pictorial and Print		n.s.	n.s.	<.05	<.01	<.01
Pictorial and Print			n.s.	n.s.	n.s.	<.01
Print				n.s.	n.s.	<.01
Pictorial and Audio					n.s.	<.05
Audio						<.05

* n.s.—Not significant at or beyond the .05 level.

Discussion: The results for the presentations tested in the audio-print test paralleled those of the first experiment in disclosing interference between pictorial and verbal information. Presentations involving the pictorial channel are decidedly lower than those which do not. Under the hypothesis of no interference, the addition of the pictorial channel should produce no difference in the amount of learning. The audio-print condition is superior as expected under the combined first and second hypotheses and as predicted by the third hypothesis. Under all hypotheses, therefore, the audio-pictorial-print condition would be expected to be the superior presentation involving the pictorial channels. The fact that this expectancy is not met is possibly an effect of the interference.

Under the experimental hypotheses, it was expected that the audio-pictorial-print presentation would produce the highest amount of learning for both audio-pictorial and print-pictorial testing conditions. Second magnitude positions were predicted for pictorial-audio and pictorial-print in their respective channels, but this expectancy did not occur. The audio-pictorial-print presentation achieved its expected position for the pictorial-audio test but was preceded by the audio-print condition on the pictorial-print test. Neither the pictorial-audio nor the pictorial-print conditions achieved their expected positions.

It was further expected that verbal-pictorial tests of the presentations involving the verbal plus pictorial channels would indicate greater learning than either the pictorial or verbal tests. Since the subjects were randomly assigned to all 20 conditions simultaneously, it was possible to test the prediction that (1) the pictorial-verbal presentations tested on pictorial-verbal channels would show significant advantage over their

respective presentation conditions tested on the audio-print channel, and (2) there would be no significant difference between verbal presentations tested on pictorial-verbal channels and verbal presentations tested on the audio-print channel. This expectation was confirmed. All of the pictorial-verbal comparisons were in the expected direction. Four of the six were significant and the other two closely approach significance. All of the verbal comparisons revealed chance differences. This should be regarded as support for the combined first and second hypotheses. The third hypothesis receives further support from the strong showing of both conditions involving the audio and print channels.

Considerations Based on the Combined Experiments

The interference which was observed when the pictorial-verbal presentation channels were tested on single channels in the first experiment and on the audio-print channel in the third experiment was rather unexpected. It was assumed that the subjects would perceive the names and pictures as related information identifying a person, and attempt to learn the relationship with little interference resulting from concentration on one type of information at the expense of the other. Since interference, though unexpected, did apparently occur, its relevance to a theoretical position derived from the previous literature should be examined. A generalized statement of this position is as follows: When simultaneous unrelated information is presented over two or more channels and the difficulty (either rapid rate of presentation or cognitive complexity) of the information is such that successful alternation of attention is not possible, the amount of learning from both channels is reduced.

This conclusion was reached by Munsterberg and Bigham (20) following a large variety of experiments with audio and print channels in which information was presented simultaneously and in alternation. More recent experiments following the Munsterberg and Bigham paradigm have been performed by Mowbray (18, 19) and Klemmer (11, 12). These experiments have supported the findings of Munsterberg and Bigham and have added two corollary observations, namely:

1. When two channels simultaneously present information of unequal difficulty, the greatest reduction in learning will occur for the easier information.

2. The audio channel suffers more from competition than either the pictorial or print channels.

However, it should be noted that Mowbray (18) did not achieve this second effect with continuous meaningful material (prose passages); thus the generalization of this phenomenon may be limited.

Since the experiments were not arranged to produce interference effects, it is not possible to use the results to confirm the interference theory. It is only possible to say that the theory does predict the interference aspect of the results. Somewhat better justification may be found for corroborating the first corollary hypothesis of Klemmer and Mowbray, dealing with information of unequal difficulty simultaneously presented. Inspection of results of the first experiment indicates that the most difficult channel in this study is the pictorial. By the first hypothesis it is therefore expected that:

1. M(Pict-Pict)-M(Aud & Pict-Pict) <M(Aud-Aud)-M(Aud & Pict-Aud)
2. M(Pict-Pict)-M(Pr & Pict-Pict) <M(Pr-Pr)-M(Pr & Pict-Pict)
3. M(Pict-Pict)-M(Pr & Pict & Aud-Pict) <M(Aud & Pr-Aud & Pr)-M(Pr & Pict & Aud-Aud & Pr)

(M=Mean)

This expectation is confirmed in all three instances, lending further support to the first corollary hypothesis. The second Klemmer-Mowbray corollary cannot be tested in these experiments because (1) the redundant information in the audio and print channels does not produce the required interference, and (2) the corollary is only testable when the difficulty of the information in the competing channels can be demonstrated to be equal.

The interference between the pictorial and verbal channels leads to difficulties in applying the experimental results to the original experimental hypotheses under consideration. Under conditions of interference, the subjects pay more attention to one of the channels than the other and the effects of the divided attention upon the single test channel comparisons cannot be assessed. In the present experiments one of the results of interference is relatively superior performance of the verbal presentations in all testing situations. Other interference effects doubtless reveal themselves in aberrations of the data.

In spite of these difficulties, it is possible to discern a general tendency for single channel and audio-print presentations to produce maximum effectiveness on single channel tests, and for verbal-pictorial presentations to gain decisively in effectiveness when tested on com-

binations of pictorial-verbal rather than single channels. The replication derived from the large numbers of conditions, subjects, and tests gives considerable strength to these observations although new experiments are needed to strengthen the theoretical position in regard to details.

It is concluded that learning of simultaneous information presented over multiple channels follows a stimulus generalization model with respect to the relation between the number of channels in the presentation condition and the number of channels in the testing condition. The general expectation is that multiple channel presentations do not produce increases in learning over single channel presentations unless the situation in which the learning is elicited also contains the additional cues. Under conditions of channel interference, multiple channels may actually produce inferior learning because attention is divided and optimal learning is not possible in any of the channels.

This last observation is one which should be well noted by practical communicators. It may be remembered that the experiments anticipated a positive relationship between the pictorial and verbal information. The unexpected interference which took place may also occur in many multiple media communications. The assumption that adding units increases communication effectiveness is a very dangerous one. The case where a learned association exists between pictorial and verbal stimuli is a common one and deserves considerable experimentation—the interference or facilitation depending on the nature of the association. But the case where no strong association exists between verbal and pictorial information is also common. This has been studied and is apparently quite likely to lead to interference. Pictorial illustration in many cases may distract rather than illustrate. Attention-getting devices are of value only if they neither distract from learning which is already taking place nor continue in competition with the material to which they are supposed to direct attention.

The tradition in television message composition is to place the majority of the information to be learned in the verbal audio channel and to attract attention and illustrate in the pictorial. Too often the picture is not properly related and a real barrier to effective communication is created by a tendency to focus attention on the picture when the message to be learned has been coded in the sound track. Television commercials always begin by attempting to focus attention on the viewing screen rather than the sound. The writer cannot think of a single exception.

There are additional implications for educational and market researchers who attempt to assess the effectiveness of the multiple channel media in producing learning. In almost every instance the assessment has involved a single channel, usually print. The weight of the experimental evidence indicates that this form of testing does not measure an adequate amount of multiple channel learning and may lead to erroneous conclusions through the necessity of testing pictorial information with verbal questions.

Finally audio-print facilitation which was strongly supported in the present studies is well enough established to deserve wider application than it presently receives.

Summary and Conclusions

Three experiments are described wherein information is presented simultaneously by all possible combinations of the audio, pictorial, and print channels and subsequently tested on the same variations of combinations of three channels. The information presented was intended to be redundant between the audio and print channels and positively related between the verbal and pictorial channels. The following conclusions are drawn:

1. The learning of simultaneous information presented over multiple channels follows a stimulus generalization model with respect to the number of channels in the presentation situation and the number of channels in the testing situation. The general expectation is that multiple channel presentations do not produce increases in learning over single channel presentations unless the situation in which the learning is elicited also contains the necessary additional cues.

2. Redundant information simultaneously presented by the audio and print channels is more effective in producing learning than is the same information in either channel alone.

3. Under conditions of interference between the pictorial and verbal information, the most difficult information (pictorial) is the least affected by the competition.

4. The findings are relevant to certain applied multimedium learning presentations discussed.

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Television and Army Training: Color vs Black and White

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PART II. Two factors spurred this second study of color in television instruction: (1) the availability of subject matter which made a more extensive use of color possible; and (2) the possibility of increasing the amount of exposure of trainees to color television instruction. These factors existed at the U. S. Army Ordnance Guided Missile School, Huntsville, Alabama, where the present study was carried out from September 1959 to January 1960.

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THE MAJOR OBJECTIVE of the present study was to compare the teaching effectiveness of color and monochrome television instruction, basing the comparison on test scores achieved immediately after instruction. Subsidiary analyses were made of the effects of trainee aptitude and type of subject matter upon learning. Equipment, facilities, and study design were essentially as described in the first study.

Subject Matter

A total of 15 different lessons were televised about an average of three times each. Fourteen lessons dealt with guidance and missile repair of the Nike system. Table 1 lists the lessons used by title. The major portion of the teaching presentations featured use of color in charts, diagrams, and equipment to a degree far exceeding that in the previous study. The number of color charts, diagrams, and training aids were also increased.

TABLE 1—LESSONS USED IN STUDY

Nike Mechanical Repair Course	*Nike Internal Guidance Repair Course*	*Officers Training Division*
Hydropneumatic System	Ajax Guidance Unit	Air Defense and Introduction to Nike-Hercules
Air Pressure Valve	Analysis of Test Selector Switch	
Ajax Propulsion System	Transponder Control	
Propellant Start and Fuel Shut-Off Valve	Transistors	
Ajax Propulsion Dump Valve	Test Selector Switch	
Eleven Control Mechanism	Nike-Hercules Missile Power Supply	
	Internal Guidance Set	
	Nike-Hercules Wave Guide Assembly	

Tests

All comparisons were based on multiple choice tests given immediately after instruction. Test instruction procedures were the same as those described in Part I. However, as a result of more intensive use of color in the present study, it was not possible as in the first study to differentiate or classify test items as to whether they tested color or non-color information exclusively.

Trainees

The trainees were 116 enlisted, officer, and civilian personnel enrolled in either the Surface to Air Missile, or Officers Training Division, at the Ordnance Guided Missile School. Trainees were members of different training cycles, varying as to course of instruction and date of enrollment. Matched pairs of trainees from a given cycle were assigned to the color or monochrome receiving sites. Scores on the Electronic Inventory, a test developed at OGMS, provided the basis for matching trainees enrolled in the Nike Internal Repair curriculum and those enrolled in the Officers Training Division. Civilians were matched with civilians and, similarly, enlisted personnel were matched with one another. Enlisted personnel, enrolled for Nike Mechanical Repair, were matched on the basis of the Army Mechanical Aptitude Test; civilians, on the basis of the authorized civilian edition of the Army General Classification Test. In matching, a roster was made ranking appropriate trainees according to their aptitude scores. Trainees were

then assigned to one of the receiving sites, based on the toss of a coin. As indicated in Table 2, the extent to which they viewed television instruction depended upon the training cycle to which they belonged.

TABLE 2—AMOUNT OF TRAINING BY TELEVISION

Trainee Cycles	*No. of Trainees**	*No. of Lessons*
Mechanical Repair A	14	2
Mechanical Repair B	12	5
Mechanical Repair C	10	6
Mechanical Repair D	12	3
Mechanical Repair E	14	1
Internal Guidance A	14	2
Internal Guidance B	14	3**
Internal Guidance C	8	6
Officers Training A	18	1
TOTAL	116	

* Twelve trainees within the various cycles were absent at one time or another during the study.

** Tests were not administered after this cycle's second lesson.

Instructors

Eleven instructors, all with considerable experience in the instruction of their subjects but none with prior television experience, participated in the study. Six were responsible for one lesson each, three were responsible for two lessons, and one instructor presented three different lessons. The instructors taught as they would in the classroom and the color and monochrome sited classes received simultaneous instruction via the color compatible television facility.

Training Site

As indicated above, color and monochrome trainees received instruction in separate classrooms, which were normally used for instructional purposes at OGMS. Each student was seated at an angle which exposed him to a minimum of glare and reflection from outside light. The ambient light within the darkened room was sufficient to permit students to transcribe and review notes.

Results

The primary question under study concerned the relative effectiveness of color and monochrome television as training media. The results,

as indicated in Table 3, provide no evidence that a significant difference in training effectiveness exists. This confirms the results of the first study.

TABLE 3—MEAN IMMEDIATE RECALL TEST SCORES[1] FOR THE MONOCHROME AND COLOR TV GROUPS

Lesson	*Immediate Recall*		
	Monochrome	*Color*	*Difference*
Hydropneumatic System	5.17	4.83	.34
Air Pressure Valve	5.13	4.87	.26
Ajax Propulsion System	4.94	5.06	−.12
Propellant Start and Fuel Shut-off Valve	4.76	5.24	−.48
Ajax Propulsion Dump Valve	4.95	5.05	−.10
Eleven Control Mechanism	5.27	4.78	.49
Ajax Guidance Unit	4.88	5.12	−.24
Analysis of Test Selector Switch	4.85	5.14	−.29
Transponder Control	5.08	4.76	.32
Transistors	5.17	4.83	.34
Test Selector Switch	5.00	5.00	0
Nike-Hercules Missile Power Supply	4.78	5.03	−.25
Internal Guidance Set	4.98	5.02	−.04
Nike-Hercules Wave Guide Assembly	5.21	4.79	.42
Air Defense and Introduction to Nike-Hercules	4.85	5.15	−.30
TOTAL	75.02	74.67	.35

[1] In order to equate tests for difficulty and variance and thereby increase experimental sensitivity, all tests were converted into standard scores to which a constant of 5 was added in order to eliminate negative values.

Additional analyses were carried out to determine whether the effectiveness of color and monochrome television could be related to the aptitude level of the trainee-viewers. The color and monochrome trainees were subdivided into high and low aptitude groups, which were then separately analyzed. Table 4 presents test scores of high and low aptitude trainees tested immediately after instruction. The results indicate an equivalence in the training effectiveness of color and monochrome television for both groups when test scores on immediate recall constitute the criterion for effectiveness.

As in previous studies, aptitude level rather than type of instruction predicted most accurately the amount of learning which occurred.

Discussion

Despite the use of subject matter with greater color content and special efforts to increase the use of color over that normally found,

TABLE 4—IMMEDIATE RECALL FOR HIGH AND LOW APTITUDE TRAINEES

Lesson	*Aptitude*	*Monochrome TV Mean*	*Color TV Mean*	*Mean Difference*
Hydropneumatic System	High	5.52	4.97	.55 m [1]
	Low	4.89	4.72	.17 m
Air Pressure Valve	High	5.23	4.84	.39 m
	Low	5.04	4.90	.14 m
Ajax Propulsion System	High	5.54	5.29	.25 m
	Low	4.40	4.86	−.46 c [2]
Propellent Start and Fuel Shut-off Valve	High	4.78	5.26	−.48 c
	Low	4.75	5.23	−.48 c
Ajax Propulsion Dump Valve	High	5.26	5.43	−.17 c
	Low	4.67	4.72	−.05 c
Eleven Control Mechanism	High	5.43	4.72	−.71 m
	Low	5.14	4.84	.30 m
Ajax Guidance Unit	High	5.68	5.29	.39 m
	Low	4.28	5.00	−.72 c
Analysis of Test Selector Switch	High	5.81	5.46	.35 m
	Low	4.14	4.91	−.77 c
Transponder Control	High	5.24	5.73	−.49 c
	Low	5.00	4.27	.73 m
Transistors	High	5.76	6.12	.36 c
	Low	4.78	3.98	.80 m
Test Selector Switch	High	4.80	4.80	0
	Low	5.14	5.14	0
Nike-Hercules Missile Power Supply	High	5.61	6.36	−.75 c
	Low	4.22	4.47	−.25 c
Internal Guidance Set	High	4.98	5.63	−.65 c
	Low	4.98	4.41	.57 m
Nike-Hercules Wave Guide Assembly	High	5.70	5.80	−.10 c
	Low	4.81	3.94	.87 m
Air Defense and Introduction to Nike-Hercules	High	5.07	5.63	−.56 c
	Low	4.68	4.77	−.09 c
	High	80.41	81.33	−.92 c
	Low	70.92	70.16	.76 m

[1] (m) indicates monochrome superior.
[2] (c) indicates color superior.

results of this study agree with those of the previous one in failing to provide evidence of significant difference in teaching effectiveness or learning between color and monochrome television instruction. Again, a reservation made in the discussion of the first study applies here. The efforts which resulted in increased use of color in this study can not be described as equivalent to a systematic variation of the study of the effects of color upon learning, nor does failure to find evidence of a difference mean that no difference exists. However, both the present and the previous studies represent extensive attempts to determine

whether such differential effects existed using a variety of subject matter including, in the present study, subject matter where color was massively and pervasively employed. Stated conservatively, the results of the two studies do not support the use of color as opposed to monochrome television for teaching materials of the type examined in these studies.

COMMUNICATIONS PROGRAMS: AN APPRAISAL

Donald P. Ely

*This is the final article in a series on communications programs in higher education. The information presented here is based on an intensive study of 21 universities using the communications label to denote interdisciplinary programs concerned with the transmission of ideas. The programs examined give evidence of a coherent arrangement of courses and/or administrative patterns which shed light on the interdisciplinary approach to communications. Previous articles * have been concerned with objectives, administrative structure, curriculum, and research activities of the various programs. This article is an assessment of the communications programs in 21 universities studied.*

SINCE ALMOST every interdisciplinary communications program in higher education is an amalgamation or elaboration of previously existing programs, its uniqueness is frequently questioned: "What is being accomplished under the communications label that could not be accomplished otherwise?" From this question stems the logical follow-up: "What factors tend to influence the progress of programs?" This article attempts to answer both of these questions.

THE COMMUNICATIONS LABEL

There appears to be a justifiable use of the communications label to identify interdisciplinary programs which relate to the transmission of ideas. This justification stems from four major factors identified by program administrators as accomplishments achieved under the communications label that probably would not otherwise occur. These factors are: (1) a unity of approach, (2) a sense of freedom and flexibility, (3) an interdisciplinary orientation, and (4) an approach to mass media as social institutions.

* AV COMMUNICATION REVIEW: "Communications Programs in Higher Education" (8: 69-73, Winter 1960); "The Communications School: Neophyte in Higher Education" (8: 20-27, Supplement 2, September-October 1960); and "Communications Programs in Higher Education: Objectives and Curricula" (8: 289-94, November-December 1960).

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Unity of Approach

The use of a single label to identify a complex of diverse units is not uncommon in American higher education. The word "university" is a label for a group of smaller units called "schools" or "colleges"; the label "school" or "college" covers a number of departments or divisions. These relationships are accepted and the unifying label adequately describes the functions of the smaller units.

Problems frequently arise, however, when departmental or college boundaries are crossed in order to establish new alliances. The fields usually included in a communications program stem from diverse departments and colleges; hence, a rallying point appears to be required. The communications label has provided this type of focus. It seems to bring together faculty and students who are traditionally housed in a variety of departments, or colleges who need to establish an academic home for interdisciplinary research and study.

The introduction of core courses is another attempt (from the curricular point of view) to achieve unity. Without core courses the student is obliged, on his own, to assimilate and organize into a meaningful pattern the diverse approaches offered by a miscellany of courses. The practice of establishing administrative units for communications programs is further evidence of the drive for unity. Six communication research institutes reflect the philosophy of unity in the research area. The acceptance of communications as an interdisciplinary field in at least 21 universities across the United States provides a unified approach to the common problems of the related fields.

A Sense of Freedom and Flexibility

As a result of the unity afforded by the communications label it becomes possible to approach problems of curriculum, research, and administration with greater flexibility. Unity brings freedom to explore related fields in the name of communications. This is brought home particularly to students who might otherwise be barred from taking advanced courses. The communications major is usually identified as a student who is following an interdisciplinary pattern. Channels are opened to him which might otherwise be closed. The fact that so many programs, especially on the graduate level, are tailored to the student's interests and abilities shows the flexibility of the communications structure.

Many of the current research topics in communications indicate that there is also a crossing of lines in this area. Professors in a related field (psychology, for example) often collaborate with representatives from the media fields (broadcasting, for instance). It is also apparent that reseachers in communication freely call upon faculty members in other departments and colleges who can assist in ongoing studies. This type of cooperation in research is further indication of the freedom which the communications label engenders. The fact that eight of the 21 universities believe that additional fields will be incorporated into their programs demonstrates the administrative flexibility of the communications structure.

An Interdisciplinary Orientation

An interdisciplinary program by its very nature establishes new alliances with related fields and is able to draw

upon the research of several disciplines as the results apply to the common focus—in this case, communications. More than any other factor the potential for interdisciplinary work was felt by the institutions studied to be the primary justification for the communications label.

[It has been shown, however, that interdisciplinary study in communications is still a potential rather than an actuality. The fact that 10 of the 13 undergraduate programs are dominated by a major in a traditional field indicates that the potential has not been reached. It also reflects a reluctance on the part of undergraduate advisers to allow a student to study communications without some clear departmental identity. It is in the selection of a minor and elective courses that the broad communications perspective is approached.]

In a sense, each of the justifications for the communications label cited in the preceding paragraphs—unity, flexibility, freedom—relate to the interdisciplinary character of the programs. Beyond these, however, is the prime justification: As an interdisciplinary approach to the study of the transmission of ideas, communications has bridged the gap between professional training programs and the intellectual strengths of the university.

Communications is a field, not a discipline, but to it come faculty and students from many disciplines with their unique tools and insights. Because it is broader in structure than the separate disciplines themselves, its deliberate ambiguity is often its strength. Communications is a meeting place for people who represent the practical aspect of training students for the media industries and those who represent the theoretically oriented fields concerned with media as social institutions.

The "Social Institutions" Approach

From an historical viewpoint, the fields represented in the communications amalgamation—journalism, radio-television, cinema, etc.—were oriented toward the practical aspects of training for the media industries. This approach is often referred to as the "trade school" approach. The present programs show a trend away from the vocational aspects of communications and are, instead, studying the media as social institutions.

At Stanford University, for example, the strictly technical courses are about 8 percent of the undergraduate's program. In many programs students are encouraged to take work in the related fields of sociology, psychology, and political science—all of which view the mass media as elements of society. The heavy weighting of required supporting fields toward the social sciences indicates similar views on the part of communications educators. The emphasis on required courses in the social sciences may be evidence of a trend away from the vocational approach of earlier journalism and broadcasting toward a more substantive program for students preparing to take over responsibilities in the media industries.

Mass media as social institutions has been a difficult concept to advance at certain universities where the communications training programs have firm vocational roots. The move to the newer concept has appeared at universities where the communication faculties have most forcibly seen the need. The matter is clearly in the hands of the chief ad-

ministrator in communications and his faculty. The social institutions approach has been more prevalent on the graduate than on the undergraduate level.

THE PROGRESS OF PROGRAMS

Four major areas influence the progress of programs—development, philosophy, curriculum, and administration.

Development

The factors which originally led to the establishment of a communications unit often are a major influence on its progress. Programs which appear to have developed most extensively have begun at the "grass roots." Pressure from faculty members of several disciplines to unite under the communications label usually engenders a better atmosphere for future operation. Where programs have been established by an administrative "coup," feelings of resentment or indifference appear on the part of faculty members who dislike being moved into a new unit without previous consultation. Interviews with faculty and administrators showed that a program is more likely to succeed if the idea has originated in the minds of those who will be involved. A faculty which supports the communications program from the beginning maintains greater interest and exerts more leadership than one which merely follows an administrative decision.

Philosophy

The operational philosophy of each program depends upon the nature and extent of the following factors: unity of approach, freedom and flexibility, commitment to an interdisciplinary approach, and a concern for the mass media as social institutions. The consensus of administrators indicates that the program which uses the communications label as a unifying force, allowing students freedom and flexibility to study mass media as social institutions according to an interdisciplinary approach, is following a sound educational philosophy.

Curriculum

The interdisciplinary philosophy which motivates programs is an important aspect of a vital curriculum. Responses on questionnaires used in the present study bear out the importance of the interdisciplinary approach and the social science emphasis.

One obstruction to curriculum improvement in certain universities was identified as the lack of cooperation between the communications unit and other related units of the university. It is inherent in the nature of communications to seek out relationships with other disciplines. When these related disciplines fail to see their part in the communications program and refuse to admit students to certain courses without a string of prerequisites, a curricular void develops. There is possibly a relationship between this fact and the statement by eight chief administrative officers that they envision the addition of certain fields to the existing program. Addition of new fields not commonly associated with the communications complex may be one way to overcome this barrier of indifference on the part of some so-called related fields.

Offering the communications program on the graduate rather than the undergraduate level also tends to strengthen it. It is at this level that the interdisciplinary programs have more freedom

to emerge. With undergraduate general education requirements fulfilled, and perhaps a major in a media field, the graduate student is free to move toward his own interest. The program developed for the student, particularly the doctoral candidate, becomes a personal curriculum charted through consultation between the student and adviser.

The communications curriculum which includes unifying experiences, i.e., core courses, seems to add vitality to the program. Core courses appear, in fact, to be an asset to the program wherever they exist. An introductory course which presents the nature and scope of the communications field usually provides a firm background for the undergraduate or graduate student. The seminar course, appearing toward the end of the undergraduate and/or graduate program, brings together many of the diverse concepts developed within the communications unit and the related disciplines. The course in research procedures, offered primarily on the graduate level, presents the type of problems confronted in communications research and discusses the procedures for studying them.

One of the most crucial concerns about curriculum is that there be a balance between theory and practice. Some universities felt that they leaned too much in one direction or the other. Where programs are dominated by either the theory of communications or the media training aspect of communications, a restriction is placed upon its progress.

Administration

Where there is an independent dean, director, or chairman in charge of the communications program, there is evidence of stature. An independent chairman usually reports directly to one of the central administrative officers of the university—to the dean, vice president, or, in some cases, to the president. Communications programs thus administered have an independent budget and free rein in selecting new faculty. Administrative channels are fewer when decisions need to be made. Programs administered in this manner do not tend to be an appendage supported by the interest of the few who carry on the work as an overload or extra assignment.

An enthusiastic, well-informed central administration tends to promote the communications program. To merit administrative support, the program heads usually point to the fact that graduates are well placed, that research is being supported by financial resources outside the university, and that services are being provided to the university as a whole.

Some universities reported a lack of financial support to carry out certain aspects of their program which require additional personnel, research dollars, and physical facilities. The lack of appropriate housing was mentioned specifically by several universities. Lack of funds is the basic deterrent in each case.

Untenable relationships between the administrative heads of the university and the communications faculty tend to hinder the development of programs in some cases. When the administrator of a communications program reports "faculty jealousies" because of prerogatives given to him, there seems to be a conflict involving administration and faculty. The problem may be one of human relations.

Stuart Chase has pointed out that communications is ". . . a verbal tent above a very large and active circus." [1] This study reinforces his opinion but also reflects the ambiguity of the term—an ambiguity that provides an interdisciplinary unity allowing the student freedom to explore new horizons which might not otherwise be open to him.

[1] Chase, Stuart. *The Power of Words*. New York: Harcourt, Brace and Company, 1954. p.19.

THE IMAGE OF THE CIVIL WAR

*Robert W. Wagner**

IT HAS BEEN ESTIMATED that an average of one new book about the Civil War has been published every day since 1861. This immense verbal record has of late been amplified by a considerable visual reportage in the form of motion pictures, television shows, and by the publication and republication of pictorial history books commemorating the Centennial of the Great American Conflict.

Among the better re-enactments or dramatizations of the period is Griffith's classic film, *The Birth of a Nation*, which still stands as a very good performance along with Huston's *Red Badge of Courage* and *Gone with the Wind*. Among the best of the recent television re-enactments are six short films based on incidents in the life of Lincoln. Written by James Agee, they appeared first on *Omnibus*. However, the majority of feature films, television presentations, and instructional films which attempt re-enactments of the Civil War period tend to be stagey and exhibit an obvious lack of authenticity.

More successful, and certainly more interesting from the communications point of view, are the reconstructions based upon contemporary illustrations. *Lincoln Speaks at Gettysburg*, for example, is a film by Paul Falkenberg and Lewis Jacobs based on engravings and drawings by Winslow Homer and Thomas Nash. *The True Story of the Civil War*, produced by Louis Stouman, is composed of photographs from the files of the Library of Congress. Still other presentations are based on woodcuts or on the sketches of wartime artists such as Edwin Forbes, and Alfred and William Waud.

The emergence of an extensive photographic record is, however, the most significant documentation of the Civil War and the period immediately following. The importance of this pictorial image is only now beginning to be fully realized.

During the period in which these pictures were made, they were probably seen by relatively few people, and then only as *carte de visites*, stereoptican views, or lantern slides. The half-tone process for reproducing photographs was not developed until 1880, and publications such as *Frank Leslie's Illustrated Newspaper* and *Harper's Weekly* employed craftsmen to copy photographs as woodcuts or engravings.

With the end of the war, many of the negatives were lost, scattered, or

* See announcement on front page.

thoughtlessly destroyed because their value to posterity was not appreciated. A long and tedious search was required to assemble the fragments found in attics, barns, in the bottom of old trunks, and in even more unlikely places. The search is still going on, and the findings are being catalogued by the Library of Congress. Modern publishers have recognized the inherent public interest in these old collections (although they seem to be a little late in getting around to it).

Gardner's Photographic Sketch Book of the War, which first appeared in 1886, was not considered worthy of republication until 1959. Yoseloff's *Photographic History of the Civil War*, first appearing in a limited edition in 1911 and containing 3000 photographs, was not republished until 1957, although it is a kind of photographic "Rosetta Stone," described by Beaumont Newhall of the George Eastman House as "the catalogue, the key, the index to the most important historical corpus of photographs made in the nineteenth century."[1]

The name of Mathew Brady has become so firmly associated with the photographic documentation of the Civil War that other photographers of the day[2]—Alexander Gardner, Tim O'Sullivan, Thomas C. Roche, George N. Barnard, George S. Cook, and still others, many of whom were Brady's assistants—are all but forgotten. This is not to minimize the importance of Brady who provided the creative, executive, and financial initiative, but only to suggest the team effort which went into the production of the record.

Bulky cameras, long exposures, and tedious darkroom operations limited photographers of Brady's day to portraits, views before battle, scenes of the terrible aftermath, and representations of other essential static subject matter. Despite the fact that they were posed, these images, nevertheless, seem remarkably real. Perhaps the fact that the subjects recognized the presence of the camera gives the pictures something of the "live" quality of a television program, and at the same time makes the resulting photograph appear objective and honest. Or perhaps the detailed recording of what is often static and commonplace makes a more truly representative picture than the "decisive moment."

An important part of the image of the Civil War is found in the studied portraits of Lincoln, Grant, Lee, Jackson, Meade, Rosecrans, Sheridan, Sherman, and other leaders on both sides of the conflict. Perhaps even more important is the fact that for the first time in history we also know the faces of the hitherto anonymous men in the ranks. Now we can see the images of the kind of men who, in wars from the beginning of human history, died on command—unremembered or at best known only for the lifetime of the few they left behind. Now we know Private Edwin Jennison of a Georgia infantry regiment who died at Malvern Hill; Private Morton Williams, killed at Murfreesboro in 1862; Private Charles Comes, 8th Loui-

[1] *Image*, No. 55, November 1957, p. 220.

[2] In the television series, *The American Civil War*, written and produced by Roy Meridith and William Kaland, the common but erroneous reference is made to Brady's work as "the first time in history that a camera had ever been taken to war." Actually, the first "war photographer" was probably Karl Baptist von Szathamari who took at least 200 photographs in Wallachia during the Russo-Turkish conflict of 1853 and 1854, followed closely by Roger Fenton, the British photographer of the Crimean campaign of 1855. Several photographs of the border conflict with Mexico in 1848 also exist, but the photographer has never been identified.

siana infantry, killed on the first of July, 1863; and, pictured side by side, Lt. John Greble, USA, and Private John Werth, CSA—the former killed, the latter wounded in the same skirmish.

We can stand on the porch of Lee's home in April 1865 and see how this great leader actually looked just after Appomatox. We can compare his image with one of three Confederate soldiers captured at Gettysburg in thread-bare, ill-fitting uniforms with their meagre possessions hung about them—a blanket, a tin-cup. Here, in two pictures, is the poignant image of a lost cause.

In many ways Civil War photography actually seems to foreshadow the recorded image of World War II. A photograph of the dead against a fence on the battlefield of Antietam is a companion piece to a scene of corpses along a hedgerow on the battlefield of France made some 80 years later. Together they seem part of one time—almost the same war, a part of the same continuing series of organized struggles which have characterized human history.

The living skeletons of Union soldiers released from Andersonville prison in 1865 cannot be distinguished from similar photographic records of the victims of the Belsen concentration camp more than three-quarters of a century later.

The pictorial record of the war crimes trials and executions following World War II are preceded by Alexander Gardner's photographs of the execution of Henri Wirz who, as commandant of Andersonville, was convicted and hanged with the Capitol dome as the background—a picture story that scooped the modern concept of pictorial journalism by half a century.

Earlier in 1865, Gardner did another picture story which records the hanging of the conspirators in the Lincoln assassination in a series of photographs so detailed that even the method of springing the death trap is clearly evident.

Grant's council of war at Bethesda Church is also documented in a sequence of photographs made by Tim O'Sullivan on June 2, 1864. The members of Grant's staff are seated on pews carried out from the church and placed under the trees. The newspapers from New York have arrived and some of the officers are seen reading while Grant, busy with plans, moves about. A passing unit stops to watch "the brass" at work, then moves on. A courier arrives with a report. Finally, Grant, making his decision, is seen signing the order for the coming battle of Cold Harbor.

Photographs like these create a sense of the reality of the past which, in the words of Thad Tate, Jr., "can open for a student a whole new level of comprehension of history." [3] It is inconceivable in view of the increasing volume of visual evidence, that history, beginning with the period of the Civil War, can ever again be properly taught without frequent reference to photographic documents. Required critical viewing as well as critical reading will be essential.

Inherent in any visual representation, of course, is the danger of over-generalizing, romanticizing, or deliberately misinterpreting pictorial evidence. After 100 years or so, photographs no longer trigger the living memory of a concrete experience, but become historical abstractions which can only help another generation imagine how it was. General

[3] "The American Past and Film: An Historian's View." *Journal of the University Film Producers Association*, Vol. 12, No. 4; Summer 1960. p. 10. (Tate is assistant director of research for Colonial Williamsburg.)

Grant, for example, could say of photographs of the war: "I knew when many of these representations were being taken, and I can say that the scenes are not only spirited and correct, but also well chosen." No one will ever be able to give this kind of evaluation of the photographs of the Civil War again. Or, as Henry Steele Commanger points out: "No one can vouch for the authenticity of the pictures. If we now accept them as part of history, we must judge the collection as history."[4]

Even the most "factual" photograph cannot escape a point of view, cannot be immune to the possibility of misinterpretation, editing, cropping, dodging, or other alterations. But this is true of all historical evidence even to the frightening degree described by George Orwell when, in *1984*, he writes: "Who controls the past controls the future: who controls the present controls the past." Less remote, but no less disturbing, are the words of M. N. Pokrovsky, the early Soviet historian (posthumously purged by Stalin in 1934), who once defined history as "politics projected into the past."

The continuing search for the facts of human history is the basic responsibility of every true scholar, every teacher, and every image-maker as well. The attention currently focused on the visual record of the Civil War should stimulate thinking about how the image of our own times will be projected to people living 100 years hence.

Brady and his assistants produced an estimated 7000 to 10,000 negatives during the war years. The number of pictures being made today by millions of professional and amateur photographers is so immense as to be measured only in terms of the multi-million-dollar volume of the photographic industry itself. Many of these images will be of as little historic value as the thousands of common chards found in primitive campfires, cold for a thousand years. Many others, because of their fugitive nature, will be lost or discarded along with other rubbish of the years.

But the photographer of the twentieth century is, as Bernard Shaw once described him, "like the cod which produces a million eggs in order that one may reach maturity." The very volume of recorded images of our time may supply that richness of historical reality, that storehouse of evidence which can supplement and counterbalance verbal reportage and thus make the falsification or distortion of the record of human events more difficult.

Whether this turns out to be true or not will depend, of course, on how seriously scholars and teachers regard the photograph, the motion picture, television, and other visual records present and past, and how well they learn to interpret, evaluate, and use these materials.

It will also depend upon the continued development of the art and science of recorded image and upon the integrity of those who create these pictures. Producers of film, television, and other visual re-enactments and reconstructions of our own time will do well to study the 100-year old image of the Civil War, and take to heart a few simple words of Mathew Brady: "The camera is the eye of history . . . you must never make bad pictures."[5]

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[4] *Image*, No. 55, *op. cit.*

[5] Horan, James D. *Mathew Brady: Historian with a Camera.* New York: Crown Publishers, 1955. p. 90.

A provocative paper by Karl U. Smith on "The Scientific Principles of Textbook Design and Illustration," appearing in the Winter 1960 issue of AVCR, *evoked some critical response from its readers. Two comments, by Seth Spaulding and Stuart Cooney, are presented, together with Dr. Smith's reply.*

SCIENTIFIC PRINCIPLES OF TEXTBOOK DESIGN AND ILLUSTRATION: A COMMENT

*Seth Spaulding**

In his convincing presentation, Dr. Smith suggests that textbook materials should be developed by an author who carefully considers how to communicate through a combination of pictorial and verbal presentation which is conceived of as a unit. You do not begin with the text and add pictorial illustration as a supplement to the completed manuscript. Nor do you attempt to develop a picture story and add text as a supplement. You carefully consider the entire programming of your material and use pictorial illustration to motivate, perceptually reinforce, and symbolically enhance the text. Often, the text must be modified to suit the pictorial illustration.

As Dr. Smith infers, however, his presentation is really a logical organization of the obvious. We know that pictorial illustration can communicate, very often more effectively than photographs and certainly more directly in many cases than verbal text. What, however, do we know of the "vocabulary" of pictorial illustration? We have certain vocabulary and readability studies of verbal language—we can predict to a degree whether or not our verbal language is using tokens within the experience of the reader and whether or not the organization of these tokens is easy to read or difficult. What, however, do we know of the readability of pictorial illustration? In other words, how do we know what art form provides the most meaningful medium to allow the reader to relate his own experience to that which is being illustrated? Dr. Smith points out that "Art . . . gives to words an immediate meaning which the reader, through his limited experience, may not be able to develop" (p. 30). How do

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we know that the reader's experience is sufficient to give meaning to the Art? An "artistic" illustration, especially in Dr. Smith's context, represents an expression of the experience of the artist, not an attempt to develop a pictorial representation based on the experience of the potential viewer. A drawing, at best, is a two-dimensional and often stylized abstraction of an experience on a continuity of abstractness somewhere between the actual experience and the use of words to describe that experience.

Actually, Dr. Smith's study which shows that "immediate verbal comprehension with and without illustrations is not significantly different" (p. 49) may indicate that his pictorial illustrations are not readable. In studies I directed some years ago among adult beginning readers in Central America, we found significant increase in immediate verbal comprehension when testing books with illustration as compared to books without illustration. Analysis of sets of illustrations which did not appreciably add to verbal comprehension of the text pointed up several probable factors of illustration "readability." For instance, the amount of information communicated by a pictorial illustration is inversely proportionate to the complexity of the drawing (or, otherwise stated, the amount of information in the drawing). Also, drawings of experiences or objects completely unrelated to the experience of the reader had little meaning. If the reader is totally unfamiliar with the subject at hand, the drawing is often as poor a substitute for the actual experience as is the verbal text.

In our studies in Central America we developed a text-picture unit in even more precise teaching machine fashion than suggested by Dr. Smith. We constructed our material in easy-to-achieve steps, keeping in mind the need to visualize as well as verbally develop each step. As a rule, we placed a full-page pictorial illustration on the left page of the book with a caption, and the text for that step on the right page. Although there usually was continuity in the material, it was developed in terms of these visual text units. The concept was christened "idea-visual," a term which sounds best when pronounced in Spanish.

In essence, this suggests a modification of Dr. Smith's procedural suggestion that the author sketch drawings which he thinks will motivate the reader, reinforce, or enhance the text. Perhaps the author should be encouraged to think visually in presenting his material much like a dramatist must think in planning the scenes of a play.

I am not convinced that "communication [between author and artist] must be carried out largely at the non-verbal level through the use of the author's drawings" (p. 42). If you ask a playwright to do a drawing of his set, the results would usually be less effective than his verbal description. According to Dr. Smith, "poor art from the author probably means poor art in the book" (p. 44). Can we not find or develop artists with a feel for communication who can work with authors if they are capable of describing what they want although inept at sketching?

Dr. Smith speaks of using professional artists in developing textbooks. Obviously, his experience is largely with college texts, for elementary and high school texts now usually incorporate art work by the best artists available. Admittedly, many elementary and high school texts are developed as a manuscript with art added as an afterthought,

but the reverse is increasingly evident, with much interaction between editorial and art staff. In planning meetings (often extended over a period of several years) there is usually much give and take between the production director (in charge of art) and the editorial directors.

The last point: Dr. Smith would rely heavily on the judgment of the artist as to how to visually express a concept. This "expression" (an integral part of impressionistic and abstract art) has meaning for the artist, but most artists would reject the notion that such art communicates to the viewer the same concept or feeling that motivated the artist to create the drawing. In a textbook, we are concerned with predicting the response of the reader and we are not at all concerned with the intrinsic value of the "expression" for the artist who does the art work. This sounds cold-blooded, but is a most practical consideration.

In essence, this is the crux of the matter. Dr. Smith's presentation is laudable in that it poses the framework for the coordinated development of illustrations with text. This is desirable and can be effective in a textbook, but what are the ground rules governing the communicative potential of pictorial illustration? Let's have some real experimental research to test out value of technical gimmicks such as Smith's "portraying of people as if observed from vantage points above" to create the illusion of actual observation of social events. Let's test out the various assumptions as to what kinds of illustration, with what content, and used in what way can do the best job in "perceptually motivating, perceptually reinforcing, and symbolically enhancing text materials." Undoubtedly, we can isolate many factors which determine the effectiveness of pictorial illustration when used to develop teaching texts in various subject areas and *at different audience levels*. As we do not use the same language in elementary school books as in more advanced ones, I am convinced that we should not use the same kind of pictorial illustration, nor use the illustrations in the same way.

This harks back to the studies which seem to show that children understand and like textbook illustrations *done by children*. But this is another story . . .

ROLE OF THE PICTORIAL IN MESSAGE DESIGN

*Stuart Cooney**

KARL SMITH'S provocative paper rather startled some designer friends of mine. The notion that design and illustration could be done by "scientific principles" seemed somehow to conflict with their artistic sensibilities. Many questions were raised that were not easily dealt with by the Smith principles. In consequence, I read the book he and his brother William had built according to the principles presented in the AVCR paper.

I recommend the experience, especially to those who have read Dr. Smith's article. For me this experience suggested several ideas that may be of interest to AVCR readers. I found myself wondering as I read the book whether words and pictures do indeed belong together at all, and if they do, what might be some other conditions of their compatibility. These are fair questions in this context, I think, because very considerable effort was made by the Smiths to see that their words and pictures were in fact well mated.

Yet, even so, I had an experience with this book similar to that of Wesley Meierhenry when he read the Brown, Lewis, and Harcleroad text on AV materials reviewed in the same issue of AVCR as Dr. Smith's paper (Winter 1960). Meierhenry wrote: ". . . one finds himself, therefore, either reading only the text and forgetting the illustrations or taking more time than should be necessary to relate the illustrations to the text." This experience is surely a function of many variables. But, it is precisely because Smith and Smith worked in a self-consciously organized way to prevent it that we are now in an excellent position to speculate and investigate the dilemma further.

A basic issue then seems to be the role of the pictorial element in a textual message. One assumption or precept implicit in the Smiths' approach is that pictorials are *aids* used to provide "the *highlighting* of main concepts, events, and situations in the reading by *illustrations* . . ." (italics mine). The pictorial is thus seen to *aid* the verbal. May I submit that the reverse may also be true: the verbal may just as often be

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very much an *aid* to the pictorial. Graphics often bear the great burden of the message. Thus, depending upon the intent of the *message*, its structure and context, the verbal-pictorial ratio will vary.

Smith has said that the pictorial and verbal material of an "illustrated book must interact in their efforts to produce a *uniform* flow of verbal and non-verbal artistic communication." May I submit further that the flow should vary in density and verbal-pictorial ratio such that reader requirements may interact with the message in a highly *variable* fashion controlled primarily by the reader.

Permit me to quote Stanley Morison, writing in the introduction to Sir Cyril Burt's, *A Psychological Study of Typography:* the reader is concerned that the printing "mechanism gives him, so far as any mechanism can, the swiftest access to the author's thought. Five hundred years of printing have conferred upon mankind the right to demand at least this service and the right to resist any impediment, however decorative, to swift reading." The role of the pictorial element should be to provide a penetration of *complex* concepts, and in fact on inspired occasions to represent the concept directly. In such instances, the well drawn or photographed pictorial element is far superior to its verbal counterpart in providing the reader swift access to the author's thought. Thus, the pictorial in message design is more than an aid, it is an integral part of the total message.

Concerning message design, a brief word on "artistic expression" is in order. Smith's concept of "the domain of the artist" is directly related to the concept of the pictorial element as an *aid,* as an "illustration." The information intent and content of the message, and the structural and contextual constraints placed upon this message, are the ultimate guides to the message design for *both* the author and the artist. The author, since he is responsible for the information, is the final arbiter of "freedom" in message design. Surely, the more frequent the exposure of the craftsmen to each other, the more "in tune" both will be to the conceptual requirements of the message. However, the freedom in the informational message will be interpretive rather than expressive.

Given, then, that the pictorial is something more than an aid in message design, some limited answer is already provided to the question whether words and pictures go well together in print at all. Perhaps they do, provided the total message is central, rather than that the printed word is central aided by illustrations.

Other conditions of the composite message provide further insight into the implications of this question of compatibility. One of these in particular would, I am sure, be confirmed by readers of the Smith paper and book. In the paper he says, "the student must explore the pictures with some help from the text." To do this, however, the reader has to break his visual scan sequence, first from the type to the picture, and then from the picture back to the type. The cue to shift from one to the other often falls in the middle of sentences, and thus the message continuity is very difficult to maintain. This locate-focus-relocate process proves to be enormously time consuming, even disturbing when the search pay-off is low, as it

quite often is. Incidentally, when the pay-off is low, the pictorial is often high in artistic freedom and low in information.

However, were the pictures and words *sequentially* linked, and were the verbal-pictorial ratio based upon some criterion such as Gibson's—words are more appropriate for presenting abstractions, and pictures for presenting concrete things (AVCR, Winter 1954)—then perhaps a more continuous reading experience would result. "Close coordination" as described by Smith appears not to be enough. Also, *sequential* arrangement of words and pictures would place greater demand upon the conceptual organization of the material and would lead to a less mechanical and more accommodating delivery. This happens, in fact, when reading the pictures *with* their captions.

The printed book requires sequential arrangement because only one sense is involved. The combined oral *plus* pictorial delivery of information, as in the speech, film, and television situations, manages to avoid this continuity problem by presenting the verbal content simultaneously with the pictorial content via *different* senses. Interestingly enough, this simultaneous or parallel presentation characteristic of the dual-sense media is the principle format used in Smith's single-sense book. This tells us something about the kinds of economic and design patterns that can be pressed upon us by the media.

In closing, a few words should be addressed to the theoretical implications for further study found in the Smith writings and reactions evoked by them. It is my hope that the Smiths will provide us with further formal and rigorous extensions of their principles and hypotheses. It would be worth checking further the predictive power of these ideas against learning hypotheses. For example: can we predict which particular format contributes most to learning in selected subject contexts? Are predictions possible concerning the verbal-pictorial ratios for given informational patterns? Can the simple conceptual system of an information sequence provide a control for these ratios?

There is some evidence that textual information can be compressed or summarized in considerable degree and still achieve a given level of learning. However, in such a situation the reading rate is inversely proportional to the amount of compression. Would the inclusion of pictorial components predictably maintain the reading speed, achieve a given level of learning, and retain the desired compression of information? The series of paper-back manuals on electronics and on computers published by Riders suggest this is possible, provided we are committed primarily to the message-design, rather than to the printed word.

THEORY OF EDUCATIONAL ART: A REPLY

*Karl U. Smith**

WE WERE INTERESTED in the comments of Drs. Spaulding and Cooney on the subject of educational art in textbook design, and welcome the opportunity to reply. The most telling point made in either of these critiques is that of Seth Spaulding, who demands some experimental justification of the use of visual art in textbooks, especially to test what types of illustration are best for different purposes and different reader groups. We agree with his call for research on these problems, and would welcome his support in carrying out projects in this area. In terms of our present knowledge, we justify our use and programming of art in books and classrooms as follows:

1. Our theory about the use of art is based on knowledge of man's evolution in work and handicraft, his recorded history as a designer and artistic communicator, and systematic scientific concepts of the neurophysiology of human motion, learning, and brain function. Our theory gives us confidence and has led into all kinds of interesting ideas and design studies of educational media, including the principles of research and training by means of audiovisumatic procedures. It enables us to relate the psychology of education and work in entirely new ways, including the relating of art and education.

2. We do not attach as great importance to the failure of artistically programmed text material to improve verbal test performances as does Dr. Spaulding. His own findings that adult beginning readers improve performance by means of related art and test material are scarcely comparable to the situation we face with advanced students. At this level, the design of tests typically favors purely verbal memory and formulation of the material. We are convinced that non-verbal communication affects not only motivation and attitudes, but long-term retention and creative thought as well. We have not as yet solved the problem of testing for non-verbal information, but are making a beginning with our audiovisumatic methods of teaching research.

3. With college students, we consider motivation and attitudes toward organi-

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zation of the textbook and of classroom teaching as significant criteria of success. These young adults are in general capable of judging whether a systematic impact is being made on their development. Our studies on attitudes toward the book, *The Behavior of Man*, show that this artistically programmed book is viewed as very highly organized by over 80 percent of beginning psychology students, whereas an outstanding book on the same subject, written with impeccably logical and scientific style but not illustrated, is considered well organized by fewer than half of the students. We accept these facts as evidence of the "readability" of the illustrated text.

4. We consider the expressed needs of students at the high school, college, and adult levels as critical in defining the worth of artistically programmed material. Our studies, both with book material and audiovisumatic teaching, show that in freely expressed opinion about the desirability of educational materials, systematically interrelated visual-verbal material always rates high. At elementary levels of schooling, of course, no one questions the value of related visual and verbal presentation.

5. Our ideas of programmed art in education go beyond the use of representative illustrations. At higher levels of education, dimensions of abstract and impressionistic art probably promote more creative individual thought than do representative displays. We would be interested in seeing comments on this significant part of our general theory. Our studies with audiovisumatic teaching have shown that when the live teacher, with all his non-verbal communicative behavior, is taken out of the teaching act, continuously programmed visuals are absolutely essential to bring life to the recorded classroom lecture. There is a lesson here for educational television, which can be drab and unconvincing if it relies too exclusively on unadorned verbal presentation.

Although we agree with most of Stuart Cooney's statements, we would like to amplify our own views on a few of the questions he raised. Our notion of educational art goes far beyond the concept of visual aid. Actually, we have rejected traditional concepts of learning and related ideas of sequential organization of human behavior in favor of a theory that defines learning in terms of a concept of the geometric or space-structuring of behavior. A number of special ideas about artistic programming have been developed in relation to these general ideas.

We would de-emphasize speed of reading as a criterion for assessing book design in favor of criteria which would emphasize organization, the promotion of curiosity, expression of human values, and individualized modes of response to the subjects of the book. For this reason, we are not too concerned when a reader reports—as does Dr. Cooney—that it often takes time to relate the illustrations to the text. That this same comment has been made about *The Behavior of Man* and the Brown, Lewis, and Harcleroad book on AV materials is not surprising in view of the fact that the AV book follows the design of our text quite closely in the use of an "art column," in the relative distribution of illustrations and text, and in other ways. Apparently these books are successful in inducing curiosity and motivating readers to explore the relationships between words and pictures.

Adequate research on problems of artistic programming requires new meth-

ods of automation and experimental control of the visual artistic and verbal dimensions of books and of classroom teaching. Up until recently, we have not had adequate methods of controlling and varying these dimensions involved in educational media. One of our efforts has been to devise and develop what we call audiovisumatic teaching methods, with which we can assess some of the quantitative aspects of response to programmed visual art and other book and classroom material.

We wish to thank Drs. Spaulding and Cooney for their interest in our paper, and for their helpful comments.

ICEBREAKER IN NEW RESEARCH FIELD

Introduction to Mass Communications Research, edited by Ralph O. Nafziger and David Manning White (Baton Rouge: Louisiana State University Press, 1958. 244 p. $5).

IN THE PAST DECADE the convergence of several applied communication areas—particularly journalism, radio-television, advertising, audiovisual instruction—has accelerated considerably. The acceleration and the convergence can be attributed to the growing realization that considerable progress can be made in both understanding and practice in each of these areas by advancing the knowledge of communication processes in general.

In this context, this collection of articles comes as a welcome and needed contribution. As the first volume to bring under one cover a brief survey of the methods of mass communication research, it is not surprising that it has been adopted as a textbook or used for supplementary readings in many research methods courses in communication programs, both undergraduate and graduate. The volume was developed and published under the auspices of the Council on Communications Research of the Association for Education in Journalism.

The editors specifically disclaim any intention of putting forward either a comprehensive textbook on communication research or a how-to-do-it manual. They claim the more modest goal of providing an introduction to an exciting area of research. In the light of this claim the monograph must be acclaimed as an extremely valuable contribution. By more critical standards, it leaves room for much improvement. It is neither a completely adequate textbook nor a satisfactory reference manual. As with many collections of articles by various authors, it is somewhat uneven, particularly with respect to level of difficulty.

Wilbur Schramm, in his highly readable section "The Challenge to Communication Research," discusses several areas of communication research which appear ready to provide rapid advances in our knowledge of the communication process. Bruce H. Westley's concluding section on "Scientific Method and Communication Research," a treatise which would have been more appropriate at the beginning than at the end of the volume, raises many of the important questions which communication research must ask of scientific method. The discussion is, however, conducted on an elementary level and is open to criticism

from philosophers of science at several points. Both Westley's article and Malcolm S. MacLean's on "Research Planning" touch very briefly on theory, but neither deals adequately with the relation between theory and empirical investigation, a subject worthy of a full section in its own right.

Paul J. Deutschmann's article, "Measurement in Communication Research," is a careful, competent discussion of the relevant problems. The article by John E. Alman and David M. White, "Statistical Methods in Communication Research," surveys many of the statistical tools commonly used in the analysis of communication research data. Both articles to some extent, and the statistics article in particular, require either very close study or a prior introduction to be properly comprehended. It might have been more appropriate for this kind of volume to offer a more general discussion of the use of statistical tools in the research process and to discuss the assumptions, limitations, and interpretation of statistical analyses. As it stands, the treatment presumes familiarity with statistical concepts such as variance, correlation, and normal curves.

Roy E. Carter presents a carefully detailed discussion of "Field Methods in Communication Research" and Percy H. Tannenbaum has a short article on "Experimental Method in Communication Research." Neither treats the use of experimental techniques in field settings. Nor is a clear distinction made between the interpretation required by results obtained from random assignment of subjects to experimental conditions and the somewhat different interpretation required of results obtained by random selection of subjects having various characteristics relevant to the research design.

These specific comments notwithstanding, the collection of articles as a whole must be welcomed as a needed contribution in a rapidly developing area of investigation.

— EDWIN B. PARKER,
University of Illinois

AV MANUAL

Audio-Visual Materials and Devices, by Ben F. Holland, Horace Hartsell, and Raymond L. Davidson (Lubbock, Texas: Rodgers Litho, 1959. 157 p.).

THIS MANUAL IS CLEARLY DESIGNED for audiovisual classes or teachers who wish to increase their knowledge of projectors or materials. Well illustrated with eight full-page plates and over 40 other illustrations of equipment, it is divided into four parts: (a) audiovisual materials and devices; (b) still projection; (c) motion picture projection; and (d) establishment or provision of building facilities which enhance learning. Schematic diagrams showing how projectors work, as well as actual photographs, should result in instantaneous recognition of equipment.

Terms defined prior to the four sections seem to confuse rather than clarify. For example, audiovisual materials are restricted to the sense of sight and hearing according to the definition given, whereas, *multi-sensory* materials include nearly all other known materials. This distinction may be open to question by many audiovisual educators, who, instead of changing *audiovisual* to *multi-sensory*, have been attempting to broaden the definition of the former to include all of the devices that might normally be classified under the latter.

A listing of periodicals omits photographic magazines, the *Journal* of the

National Association of Educational Broadcasters, AVCR, and *Film World*.

The publication has two major strengths. One is the vast amount of technical information given on tape and disc recordings, motion picture equipment, opaque and overhead projection, and slide projection. The other is the inclusion of threading diagrams for all major 16mm projectors, with the exception of the Movie Mite. There is little or no mention of radio or television in the publication but its section on facilities recommends television conduit for new school buildings. Perceptoscope is the only mention of teaching machines in this manual published two years ago.

—SHERWIN G. SWARTOUT,
State University of New York, College of Education at Brockport

ON PICTORIAL SYMBOLS

Comprehension of Pictorial Symbols: an Experiment in Rural Brazil, by Luiz Fonseca and Bryant Kearl (Madison: University of Wisconsin, Department of Agricultural Journalism, 1960).

MOST TEACHERS, educators, and textbook publishers have strong opinions about illustrations for classroom use and for textbooks. Considering the large amount of money spent on "visual aids," it is surprising to find how little basic groundwork has been done to find out just how effective different types of visual communications are in teaching, and what effect such factors as size, style, and color have. Most educators agree that "good" illustrations help. But what are "good" illustrations?

This problem has been sharpened as American technical assistance is being made available to underdeveloped countries. How can we tell illiterate and poorly educated people how to use tools, improve their health, grow better harvests and livestock? Many technicians have grasped at simple visual techniques to help them. It is not surprising that some of the most interesting testing of visual techniques is done with foreign subjects.

The report by Professor Kearl and Mr. Fonseca is based on one such study.

Using sets of about 20 pictorial symbols, Fonseca tested several hundred farm youth of 10 to 18 years of age who are members of the Brazilian equivalent of American 4-H clubs.

The club members were tested for their ability to recognize symbols which had different degrees of fidelity to objects (ant, pig, church, etc.), arbitrary symbols (question mark, dollar sign), and picture "stories" (drink boiled water, how to kill ants with insecticide). The findings, in brief, were:

1. The ability to interpret many pictorial symbols is a learned skill. Age and education influence the ability to comprehend, and learn from, symbols.

2. Intelligent selection of detail helps. Excessive detail and excessive deletion of detail reduce comprehension.

3. Recognizable familiar objects help understanding.

4. Illustration of a process requires at least as many pictures as there are steps in the process.

5. Pictorial symbols should be as "realistic" as possible.

6. People with limited education will interpret abstract symbols literally and may thus miss their intended meaning (for example, they may not understand that "skull and crossbones" means "POISON!").

7. Formal education increases the

understanding of abstract symbols, picture series, and of symbols not related to the daily life of the viewer.

The report draws a series of practical recommendations from the study which should be of value to anybody who deals with textbook illustrations, classroom visual aids, or other fields of visual communications.

One interesting finding was that illiterate youth did as well as literate ones when it came to the interpretation of symbols of objects related directly to their daily lives. However, there was a marked difference when it came to symbols which are abstract or not familiar. Unfortunately, the study did not inquire into one of the important angles of the picture versus symbol controversy, namely: which is easier to learn and to retain? It is obvious that education is needed to comprehend pictures of unfamiliar objects. The core of the problem is what can be taught easier and faster —letter symbols or pictorial symbols?

The study suffers from some shortcomings which this reviewer has found frequently in similar reports, namely, the uneven quality of the symbols tested and the lack of clear-cut definitions.

Some of the symbols tested *are* difficult to comprehend. One sympathizes with the respondents who failed to recognize a "trench silo" or who thought that the "man killing ants" was a man on a branch of a tree. Uniform quality of drawings might have affected the statistical results of the survey. For instance, the fact that 73 percent correctly identified the "humanized" ant while only 57 percent correctly identified the "humanized" pig is probably largely due to the difference in the quality of the drawings. If the drawing of the "plowing by tractor" symbol would have been as simple in design and perspective as the one of "plowing by horse," the statistical difference in correct answers may have been smaller.

In many discussions which this reviewer has had, the terms "realistic," "naturalistic," "unnecessary detail," "excessive deletion," etc. have meant different things to different people. I know of some people who would say that the recommendation to "use a bold design, simple, clear, free from unnecessary detail . . ." conflicts with the finding that "to achieve best comprehension, pictorial symbols should be as realistic as possible." A precise definition of terms would be of great help in future studies.

—RUDOLF MODLEY,
Kent, Connecticut

NOTES AND COMMENT

AUDIOVISUAL RESEARCHERS and practitioners concerned about their role as well as their "image" in society would do well to ponder the phenomenal success of three books by popular culture muckraker Vance Packard. *The Hidden Persuaders* (New York: David McKay Co., Inc., 1957) released a wave of uneasiness over bigger and better strategies of manipulation through communication. Popular notions of boundless social mobility (still an implicit assumption in much of our educational theory and practice) received a jolt when *The Status Seekers* (New York: David McKay Co., Inc., 1959) hit the best-seller

lists. But perhaps the cruelest blow of all is the current best-seller, *The Waste Makers* (New York: David McKay Co., Inc., 1960). This book argues that some of our most elaborately designed and brilliantly executed communication "successes" can be viewed as expensive "waste-making," as dismal failures in coming to grips with the long-term realities of a real world.

From manipulation through conformity to waste—what shall we make of Packard's theses, his facts, his success? Packard's is a popularized extension (some say distortion) of the work of sociologists and psychologists, catering to a market of genuine anxiety, focusing on genuine problems, and dissolving into an easily marketable but superficial critique of "commercialism" in communications and culture. His road to salvation, as Seymour Lipset pointed out, is espousal of the verities advocated by Herbert Hoover. Be that as it may, the lesson for educational communication specialists is clear: a profession in the field of communications practice needs to be as critically concerned with its "successes" as with its more obvious "problems"; slickness of technique, in the absence of genuine concern with *all* the consequences, arouses suspicion and resentment no matter what tests or administrators might say; the *what* in communications is at least as important as the *how*.

On the surface it would seem that Mack Hanan, management consultant and author of *The Pacifiers* (Boston: Little, Brown and Co., 1960) follows the trail blazed by Packard and others in his discussion of the enfeeblement of the "six symbols we live by." Actually, Hanan's diagnosis of the case is not "murder" but "suicide." In rich detail drawn from popular culture, education, the arts, and social science literature, he examines symbolic images of sex, success, security, sociability, and sophistication. He finds them "pallid, palliative symbols . . . public enemies," and "prostituted . . . by our preoccupation with tinseled sociability that is full of temporary purposes but devoid of long-term reasons." "Our only way," he writes, "lies through dissent, individuality, and unorthodoxy." This conclusion is as nobly disappointing as those of Packard. For the admirable myth of rugged, old-fashioned individualism cultivated for its own sake merely substitutes one set of "pallid, palliative symbols" for another. Were Mr. Hanan to study the symbolism embedded in crime and men's adventure fiction and drama, he would probably find much that satisfies his prescriptions, but hardly his intentions. Exhortation to moral reform is no substitute for a structural analysis of conditions inhospitable to the socially responsible cultivation of symbols of heroic stature and purpose. Until we have such analyses, we can derive much useful food for thought from such works (without taking all at face value) and apply such thought to a limited purpose in communication theory and practice. That limited purpose is perhaps best expressed in what is reported to be Mr. Hanan's motto in his work as a business consultant: "To Deny Management the Privilege of Irrational Decision."

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Two new editions of "recent classics" will be of interest to students of communications. Leo Bogart's *The Age of Television* (New York: Frederick Ungar, 1960) is in its second edition. With minor revisions and some tables brought

up to date, it is still the only comprehensive work in its field. *Mass Communications*, edited by Wilbur Schramm (Urbana: University of Illinois Press, 1960) has been extensively revised and enlarged since its publication in 1949. It includes more than a dozen new essays and some new tables. Sections on "The Structure and Function of Mass Communications" and "Responsibility for Mass Communications" have been added. Multi-disciplinary and encyclopedic (with a 15-page index), this volume is again available to serve as a text and to stimulate more integrated works in the field, roles for which it was originally designed.

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Franklin Dunham's new booklet, *Educational Teleguide: References for Education by Television* (U. S. Government Printing Office, 1959), is a storehouse of information on topics ranging from ETV channel assignments to which schools are using TV across the country. It also includes a list of 26 new books on educational television, of organizations in the field, of sources of government publications, research reports, and study grants.

Filmfacts (P. O. Box 53, Village Station, 150 Christopher Street, New York 14, $20 per year) includes complete credits, synopsis, and excerpts from reviews for domestic and foreign feature films released in the United States. Another useful reference work is the Winter 1960 issue of the *Journal of the University Film Producers Association*. The entire issue is devoted to a glossary of terms—from Ab Rolls to Zoom Lens—used in the production of 16mm non-theatrical motion pictures. Finally, *Organizations, Publications and Directories in the Mass Media of Communications* compiled by Wilbur Peterson (Iowa City: School of Journalism, State University of Iowa, 1960) is a welcome addition to the reference shelf.

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Two recent books on film bring together much fugitive material. *Film: An Anthology*, edited by Daniel Talbot (New York: Simon & Schuster, 1959) is perhaps the largest English-language collection on film theory, technique, history, esthetics, and social commentary, worthy of consideration as text at $8.50 for affluent students. *Introduction to the Art of the Movies*, edited by Lewis Jacobs (New York: Noonday, 1960) is a compendium of American essays written by and for a coterie of film enthusiasts.

Two little-known English periodicals that deserve attention are *Screen Education* and *Cinema Studies*. *Screen Education* is the journal of the Society for Education in Film and Television (57 Beresford Road, London), a 10-year-old group dedicated to the proposition that film and television are subjects worthy of study in schools, colleges, and universities. This is a modest but lively journal edited by H. R. Wills who contributes "Mass Media Review." It carries much material on the use of the film to teach *about* film in the classroom. *Cinema Studies* is a new and scholarly undertaking by the new and scholarly Society for Film History Research (3 Hollybrake Bull Lane, Chislehurst, Kent). The editor of this journal declares that "The research worker in this country [England] is worse off than his counterpart in such a country as France . . . All London can do is to support one serious periodical . . ." This in a country

which has *Sight and Sound, Sequence, Close-up, Definition, Screenview* devoted to the cinema, plus the excellent British Film Institute.

The research worker and student of film in the U. S. is no better off than his counterpart in England. We have no Film Institute, although there are extensive collections of materials at the Museum of Modern Art Film Library, the library of the Academy of Motion Picture Arts and Sciences in Hollywood, and the Farmington collection of the University of Southern California library. Of our "serious" magazines, *Film Culture* (G.P.O. Box 1499, New York 1) reappeared in semi-pocketbook format, and *Film Quarterly* (University of California Press, Berkeley) replaced (but is no substitute for) the *Quarterly of Film, Radio and Television*. *Film Culture* published in its No. 5-6 (1955) issue a scathing, confused, but stimulating article on "Audio-Visualism Versus Education" which is a recommended antidote for some of our own more pallid and palliative symbols. The two journals provide America's somewhat arty but boldest voices in cinema esthetics, social criticism, and commentary.

* * *

"The Revolution in Intellectual Work" is the title and subject of a short article by M. Vasiliev and S. Gusciov in the November 1960 issue of *The American Behavioral Scientist*. The article is an excerpt from a Soviet science book. It is based on an interview with Prof. S. A. Lebedew, electronic computer expert, who sees his field leading to "a new organization of man's intellectual work." The authors envision, among other things, a vast electronic "book transmitting network" of reproducers in every village linked to central memory banks searching for the appropriate videotape or microfilm in response to simultaneous requests from the Caucasus to Kamchatka.

The Summer 1960 issue of *Public Opinion Quarterly*, devoted to articles and studies on attitude change, reflects most major theoretical advances in the measurement and study of attitudes. "A Televised Study of Subliminal Persuasion" by Melvin L. De Fleur and Robert M. Petranoff in the Summer 1959 issue of the same journal finds subliminal communication "a very *inefficient* communication at best," and without noticeable effects in general.

Those concerned with evaluating the "non-verbal" qualities of printed materials will be interested in Merald E. Wrolstad's article on "Adult Preferences in Typography: Exploring the Function of Design" in the Spring 1960 *Journalism Quarterly*. The experiment dealt with the influence of design principles and subject characteristics upon preferences. —G.G.

■ FILMS

Schenberg, Samuel

An Experiment in the Use of Films for the Inservice Training of High School Chemistry Teachers, October 6, 1959 to February 6, 1960. Office of the Director of Science, Board of Education of the City of New York; July 1960. 18 p.

Purpose: To determine the feasibility of using a set of chemistry films for the inservice training of inexperienced and experienced chemistry teachers.

Procedure: Eighteen high school chemistry teachers and chairmen met once a week to view two chemistry films in a series of 160. Each film was discussed and evaluated as a teacher training device. On two occasions teachers gave a live demonstration of techniques used in the films. This presentation was analyzed by the group.

Results: Films were found to be useful in the inservice training of all science teachers and, as models of good instruction, were found to be especially helpful to inexperienced teachers. They were not, however, thought to provide the professional know-how that enables the teacher to control, motivate, question, and secure the active participation and cooperation of his students. Other conclusions were: films can keep teachers informed on the latest advances in science; they can be viewed repeatedly and reach larger groups of inservice teachers; and, they can raise the level of science instruction in a short time. —*L. Twyford.*

■ SELF-INSTRUCTION

Hosmer, Clark L.

Results Versus Costs of Correspondence Courses. Technical Training Group, Lackland Air Force Base, Texas. 13 p.

Purpose: To estimate the results and costs of a correspondence course compared with one taken by resident students.

Procedure: Two extension courses based on the resident course of Armed Forces Industrial College were compared. The resident course was held for 144 executives; 3500 took the correspondence course and 4500 participated in a two-week conference course held in 16 cities. Class tests were used to evaluate course effectiveness.

Results: Correspondence study was found to have the advantages of producing equivalent or superior achievement at about one-fifth the cost, greater student convenience,

and more flexibility in programming study without interference with other work. Its disadvantages included lack of oral exchange with instructors and associates and lack of full academic credit. —*L. Twyford.*

■ TAPE RECORDINGS

Edgerton, Harold A.

The Acceptability and Effectiveness of the Casual Use of Auditory Training Aids. Technical Report NAVTRADEVCEN 373-1. Research by Richardson, Bellows, and Company, Inc. for the U.S. Naval Training Devices Center, Port Washington, New York; March 1960. 77 p.

Purpose: To study the acceptability and effectiveness of recorded lesson reviews as supplementary aids to instruction in naval schools. The study was designed to discover how much trainees listen to lesson reviews—whether they appeal to trainees of higher or lower intellectual ability and the effect of such reviews upon course examinations.

Procedure: Classroom lectures totaling 826 minutes were recorded and made available to students in the evenings. Each student had a pair of earphones and a channel selector on his bunk enabling him to listen to the reviews, to listen to music, or to refrain from listening. A total of 229 trainees participated in the experiment in two schools. Listening time was recorded and scores on course examinations analyzed.

Results: Trainees listened to about half of the available reviews. There was little relationship between intellectual ability and amount of listening. The groups who listened to reviews showed no superiority in course examinations. It was recommended that listening equipment be installed elsewhere than on the trainee's bunk, that the material presented appear to be important, and that new material be presented rather than recordings of old material. —*L. Twyford.*

■ RADIO AND TELEVISION

Burrows, Robert B., and Summers, Harrison B.

Radio and Television Listening and Reading Habits of Children in Monongalia County, West Virginia. Morgantown: West Virginia University, Department of Speech, 1958. 45 p.

Purpose: To determine whether students of low intelligence, reading ability, or scholastic achievement have different listening and viewing habits from those in average and high ability groups. To discover other differences relating to the information revealed by the survey.

Procedure: The study was conducted as an audience survey using the questionnaire technique as the principal source of gaining information. Children from nine schools, including two parochial institutions, in Monongalia County, West Virginia were chosen as a typical cross-section in this area. The schools included three high schools, five elementary, and one junior high. Usable questionnaires were returned by 3000 pupils, divided almost evenly between boys and girls. The respondents

were grouped according to high, medium, and low levels of intelligence, and academic achievement. IQ's of 90 to 110 were assumed to be average, and under or over these limits established the students into one of the other groups. Information was obtained on items such as the number of radios and television sets in the home, the number of radios in family cars, radio and television listening, time spent in reading, freedom allowed by parents in radio and television listening, bedtime hour on school nights and on weekends, and favorite programs.

Results: The survey revealed that, on the average, there are two radios, one television set, and one automobile radio per household with the average increasing in the the higher grades. Boys listened to the radio less than girls. The boys' level of intelligence made little difference in the amount of radio listening. From grades 1 through 9, children with the greatest reading skill spent more time watching television. Among high school students the amount of viewing decreased with students who earn the highest grades. Girls listened more to radio, but boys were the heavier users of television. The quantity of newspaper and magazine reading increased as intelligence and achievement levels advanced, with few exceptions. Parents were found to place little restriction upon the children's listening to radio and watching television. Students in the highest intelligence bracket went to bed the earliest on school nights and on weekends. Little difference was found in the number of favorite television programs viewed, regardless of intelligence and achievement levels. This study found no consistent pattern in regard to relative amounts of listening to radio and watching television by children with different levels of intelligence and academic achievement. —*H. H. McAshan.*

■ TELEVISION

Blanshard, Paul

The Television Seminar Project. Philadelphia: University of Pennsylvania, 1959. 6 p.

Purpose: To determine the effect upon the audience of open-circuit television instruction presented for credit and to study the audience itself—who they are, what educational backgrounds they possess, how well they achieve through open-circuit television, and other factors.

Procedure: This research was conducted as an audience survey. The sample population consisted of 67 credit students from three states and 21 communities who registered for Descriptive Astronomy and Evaluation of Literature. The project results were based upon a 77 percent response of the sample population of students taught through the eighth week of television instruction. Survey questions were formulated concerning information pertinent to the purpose of the study. These questions enabled the researcher to determine audience age, location of receiver, reaction to teacher and subject matter, and a variety of other related data.

Results: Among the highlights of the survey findings are: (1) 41 percent of the students took their first college credit course via Television Seminar, (2) 80 percent believed they were getting at least as much from the tele-courses as they would by taking the same lessons on campus, (3) 63 percent felt that they were being taught as individuals, not merely getting lesson content, (4) almost half of the credit students were in their 20's, and (5) the students were almost unanimous in their hope that the University of Pennsylvania would continue presenting credit lessons on open-circuit television. —*H. H. McAshan.*

Erickson, Clifford G., and Chausow, Hymen M.

Chicago's TV College—Final Report of a Three-Year Experiment. Chicago City Junior College; August 1960. 98 p.

Purpose: To discover the feasibility of offering regular college courses for credit via open-circuit television.

Procedure: About 10 courses were televised each semester over a VHF station. Some courses were repeated in subsequent semesters. Information was collected on enrollment, costs, achievement, and acceptance.

Results: The average enrollment for each course was 172 credit and 486 non-credit students. Sixty-three percent of the students who enrolled for credit completed the courses. Television students were generally older and more highly motivated than regular college students. The incidental viewing audience was perhaps 20 to 50 times as large as the credit and non-credit enrollment. A study guide for students was found to be essential and telephone conference hours proved useful. Controversial and sensitive material was presented over the air without difficulty. Students attended two one-hour conferences and took two one-hour mid-term examinations. Credit students averaged 1.84 courses per semester by television. Enrollment declined sharply when the course was repeated too soon after its initial offering. Direct costs for television averaged $370,000 per year. Cost per credit student remained higher for television. Learning was about the same for television and resident students. The achievement on the course was such that students could be awarded credit acceptable at other institutions. It was also found that excellent classroom teachers could usually learn to be effective television teachers; more time, however, was required for preparation of lessons. —*L. Twyford.*

Suchy, Robert R.; Teel, Dwight; and Vincent, Harold S.

The Milwaukee Experiment in Instructional Television. Milwaukee Public Schools: Educational Television Project, 1957-59. 112 p.

Purpose: To determine whether or not it is possible, through the use of television as a teaching aid, to (1) teach certain areas of the curriculum effectively to pupils organized in much larger groups than is presently the case, (2) raise the level of teacher effectiveness, and (3) integrate television instruction with the instructional program at all levels.

Procedure: Nine thousand pupils from five senior high, five junior high, and 110 elementary schools were involved in the experiment. Questionnaires were answered by 1300 teachers, principals, and members of the superintendent's staff. In each of the junior and senior high schools various class organizations were used in presenting subject matter to television classes consisting of about 200 students. The subjects compared were history, biology, general science, Wisconsin social studies, and other science courses. The basic structure of the self-contained classroom was maintained in the elementary schools. However, six of the classroom teachers in each of the schools combined their classes for one period a day for instruction in science, health and safety, art, and music. All of the professional personnel involved were trained in their techniques before the beginning of the experiment. About 1200 in-school telecasts were produced from 1957 till 1960. The studio teachers made great use of varied resources such as guest speakers and thousands of audiovisual materials. Over 26,000 tests were administered to the subjects. The general plan for evaluation was to administer pre- and post-tests of intelligence to all experimental and control groups. These tests were useful in the

final matching of students in that achievement results could be generalized to a greater degree.

Results: It was possible to accomplish all three major purposes upon which this study was based. In all of the statistical analyses, the experimental groups always did as well as, or better than, the control groups. The students generally achieved more in the television classes and the teachers seemed to grow professionally. The majority of the principals stated that there were no serious problems in class or teacher scheduling. They further stated that the experiment had made more rooms available for the scheduling of regular classes. —*H. H. McAshan.*

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